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TABLE OF CONTENTS*

	PAGE
The Geography of Human Productivity . . ELLSWORTH HUNTINGTON	1
The Unincorporated Hamlet: One Element in the American Settlement Fabric GLENN T. TREWARTHA	32
Titles and Abstracts of Papers Offered for Presentation at Columbus, Ohio, 1942	82
The Description of International Boundaries STEPHEN B. JONES	99
The Political Significance of Tropical Vegetable Fats for the Industrial Countries of Europe LEO WAIBEL	118
The Seasons' Arrivals and Lengths STEPHEN S. VISHER	129
Grassland and Farmland as Factors in the Cyclical Development of Eurasian History J. RUSSELL SMITH	135
Adjustment of Agriculture to Its Environment H. H. BENNETT	163
Maps and a Mapping Program for the United States F. J. MARSCHNER	199
Abstracts of Papers Presented at Washington, D. C., September, 1943	220

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ANNALS

of the

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No. 1

The Geography of Human Productivity

ELLSWORTH HUNTINGTON

The measurement of human differences is one of the outstanding gaps in geography. We know with great accuracy the yield of wheat or corn per acre in most parts of the world. We are well informed as to the relative productivity of different varieties of oats or potatoes. We have exact data as to the differences in yield and quality of tobacco raised in different climates or on different soils. We also know a great deal about the weight of fleece, or the amount of lard produced by our domestic animals under various environmental conditions or with various types of diet. The forester, too, is well informed as to how great a yield of lumber he can expect from a given species of tree under definite conditions of climate, slope, and soil. As to man, however, we have no such definite knowledge. We are only vaguely aware of the way in which the output of agriculture or industry per man varies from region to region. We know still less as to the reasons for such variations. Nevertheless, the statistics compiled by the League of Nations and other authorities are beginning to give us a body of facts from which a great deal may be learned as to human productivity and the conditions which help or hinder it. The purpose of this paper is to bring together the best of the available statistics and make a preliminary attempt at analyzing some of their relationships.

We shall begin with comparisons of various countries as to productivity per person in agriculture and industry. That will lead to an inquiry into health, diet, medical care, wealth, and inventiveness as factors in promoting production. Climate and education will be omitted because they have hitherto been discussed more fully than the other factors as elements in the

problem of production, and also because no comprehensive new data are now available. Climate of course is a fundamental factor in health, diet, medical care and human activity, and must be considered in any full study of human productivity. Education is equally vital in guiding and stimulating the use of our abilities. Our present object, however, is merely to present the results of recent statistical studies in such form that they can readily be used for geographical comparisons. For that purpose we shall present a series of tables, and comment upon their significance.

A. Agricultural Productivity per Man

Table 1 shows the relative value of the production per man on the farms in "international units," that is, when differences in the price level are elimi-

TABLE 1
Agricultural Productivity per Man on the Farm
(After Colin Clark)

1. New Zealand	2444	11. Switzerland	433
2. Australia	1542	12. France	415
3. Argentina	1233	13. Belgium	394
4. Uruguay	1000	14. Sweden	352
5. United States	661	15. Czechoslovakia	287
6. Denmark	642	16. Estonia	268
7. Canada	618	17. Poland	195
8. Netherlands	579	18. Japan	120
9. Germany	490	19. U.S.S.R.	88
10. Great Britain	475	20. China	46 (?)
		21. India	?

nated by valuing all products at the average prices prevailing in the United States from 1925 to 1934. Milk, meat, and other animal products as well as crops are included. It is taken from Colin Clark's extremely valuable book entitled *The Conditions of Economic Progress* (1940). Women who work on the farms are not included because the way in which they are recorded varies greatly from country to country. In some countries such as Bulgaria and Germany all farm women are classed as laborers; in others such as Spain and Australia, only those who receive wages are thus classified. By taking only the men, including farm operators and farm laborers, we obtain figures which are essentially proportional to the farm production per family. Where families are large the figures given in the table must of course be scaled down somewhat in comparison with countries where the farm families are small. The differences in the size of farm families are relatively small compared with the differences in non-farm families.

The differences between country and country in Table 1 are astonishing. The average man on the farm with his family, including laborers as well as owners, produces about \$2400 worth of products per year in New Zealand,

whereas in Japan he produces only \$120, in Russia, \$88. In order to get a product 20 times as valuable as that of the Japanese, the New Zealander of course has to spend more for machinery and other equipment, but even so his net income is enormously greater. Moreover, his wife and children do not have to work nearly so much as in Japan or Russia. Next to New Zealand come three other new countries with plenty of room, namely Australia, Argentina and Uruguay. The United States and Canada, although relatively new, fall considerably lower, their production per man being little more than that of Denmark and the Netherlands. This presumably indicates a relatively mature stage of development, but it is disappointing to American pride. It may be due partly to lack of ability on our part, but climatic extremes play a part. So do the declining number of large cattle and sheep ranches in both the United States and Canada, the great number of small farms in the South, the abundance of semi-farms in the North where the men work part time in factories, garages, and so forth, and the small size of many farms in French Canada. Regardless of the reasons, however, Table 1 makes it clear that the productivity per man on the average farm of the United States and Canada has now fallen to about the same level as that of Denmark and the Netherlands, the two European countries that are most prosperous agriculturally. Those densely populated countries, in strong contrast to the new countries, owe their good productivity in considerable measure to sheer human skill.

Below the Netherlands in Table 1, Germany, Great Britain, Switzerland, France and Belgium form a block of west European countries where the production per man is worth roughly one-fourth to one-fifth that of New Zealand, and from four to five times that of Japan or Russia. Aside from Switzerland, all of these European countries border the North Sea. Holland lies close to the center of agricultural productivity in Europe. The other European countries in Table 1 surround this center at a considerable distance. As the distance from the center increases, the productivity per man declines. In poor Russia, farthest away, the average actually falls below \$100. This last figure seems almost incredible, but it is amply verified by statistics for many years, including those before the first world war as well as afterward. Among Asiatic countries, Japan apparently has the largest production per man, but its figure (120) is only one-fifth that of the United States. The chief trouble, of course, is lack of land, for in climate, agricultural skill, and activity of the people, Japan ranks high. In China, a similar degree of over-population is aggravated by unfavorable climate so that the average productivity per man is pathetically and almost incredibly low—less than one-fiftieth as great as in New Zealand.

B. *Industrial Productivity per Man*

Let us look next at industrial production. In advanced countries secondary industry, that is the preparation of products for further manufacturing or for the ultimate consumer, generally employs more people than primary production. Nevertheless, it is extremely difficult to compare the productivity per worker in different countries. Table 2 (Column B) gives what

TABLE 2
*Real Production and Income per Worker in Secondary Industry Expressed in
Clark's "International Units"*

Country	Productivity		Income	
	Date A	Amount—I.U. B	Date C	Amount—I.U. D
Canada	1924-34	2595	1935	1728
United States	1925-35	2380*	1935-6	1653
New Zealand	1924-33	1885*	1934	1123
Norway	1927-34	1260*	1930	1151
Great Britain	1924-30-36	975*	1930	1109
Sweden .....	.....	.....	1928	810
Germany .....	.....	.....	.....	.....
South Africa	1924-29	948	.....	.....
Ireland	1926-31	937	.....	.....
Australia	1924-33	925*	1935-6	1461†
France	1930	680*	1930	1375†
Italy .....	.....	.....	1928	471
Hungary	1924-33	551	.....	.....
Rumania	1929-32	543	.....	.....
Estonia	1925-34	535	.....	.....
Japan .....	.....	.....	1934	450

* From Colin Clark: *The Conditions of Economic Progress*, 1941, p. 343. Remaining figures in this column are estimates based on the German Statistical Yearbook as given by Clark, page 278, but are calculated by the author so as to be approximately comparable with Clark's other figures. They may be in error by as much as 20%.

† The figures for Australia and France are unduly high. This is mainly because of high protective tariffs in Australia and because craftsmen and small work-shop producers, such as fill the upper stories of many buildings in Paris, are not included in the French figures.

seem to be the best figures yet available. All are expressed in Clark's International units. Those with an asterisk are taken directly from Clark. The others are estimates by the author on the basis of data in the *Deutsche Statistische Jahrbuch*. They show the general order of magnitude, but are subject to a rather large possible error. Clark's figures for real income per industrial worker have been added for comparison in column D, but income and productivity are far from being the same thing. Nevertheless, except where special factors intervene, as in the case of the tariff of Australia and omitted small craftsmen in France, the variations in productivity and income

from country to country are of the same general order of magnitude. Thus Table 2 gives an approximately correct picture of the way in which the amount of manufactured goods produced by the average worker varies in different parts of the world.

In industrial, just as in agricultural productivity per person the English-speaking countries occupy a surprisingly high position. Canada appears to surpass the United States, and New Zealand is fast approaching our level. These three countries stand by themselves as extremely high in industrial production per person. South Africa and Australia also stand well and are at nearly the level of Great Britain. They owe their high position partly to the fact that they carry on a rather large percentage of industries such as flour milling in which elaborate machinery does most of the work with only a little help from the workers. Ireland also ranks high compared with the rest of Europe. It is surpassed only by other English-speaking countries and by Norway and Sweden. So far as can be judged from Table 2 the industrial productivity per worker in the rest of Europe drops to only a third or a quarter of that of Canada and the United States. Just where Germany stands as the result of World War II is unknown, but before active preparations for war were begun, its level of production per worker was probably ahead of that of France, but below that of Britain. It is interesting to note the uniformity of Hungary, Rumania, and Estonia. Italy probably stands little, if any higher than these countries, and Japan and Russia not much lower. When a country once adopts modern machinery there seems to be a tendency for the productivity per worker to remain above a certain level, regardless of the level of agricultural production. In Japan, for example, to judge from the income per worker as given in column D, the goods produced by the factory worker are worth nearly four times as much as those raised by the farmer. One's first thought is that this is because modern machinery has been introduced into a densely populated country where oriental methods of agriculture necessarily prevail. In the United States and Canada, however, there is an equally great discrepancy between the two kinds of productivity. This is an unhealthy condition. It means too many people on the farms and not enough use of machinery and modern methods. It is most curious that countries as diverse as Canada and Japan should suffer from the same lack of balance between agriculture and industry.

The facts illustrated in Tables 1 and 2 suggest a great variety of interesting problems. Why is the average production per man in agriculture twenty or more times as great in some countries as in others? Why is the difference less in industry? But even in industry why does the average worker in some countries produce four times as much as in others? Would

still greater contrasts be found if more wide-spread data were available? Why is it that in industrial productivity per worker the United States stands far ahead of all countries except Canada and New Zealand, but in agriculture ranks only a little ahead of many European countries? What factors produce such differences? Do Great Britain and Germany actually stand at nearly the same level in productivity? Is the military competence of Japan and Russia seriously jeopardized by extremely low agricultural productivity? And in all these matters what part is played by the quality of the people themselves and what part by their resources and other physical or social advantages or disadvantages?

C. *Geographical Distribution of Physical Vigor*

Omitting for the present all other factors, let us see to what extent physical vigor is a factor in human productivity. Death rates are by far the best available means of comparing the physical vigor of nations. In fact, no other method is available on a large scale. Physicians and experts in public health are practically unanimous in saying that length of life is one of the best evidences of *constitutional* vigor. Where the average length of life is long, few children die in infancy, and there is relative freedom from the weakening effects of disease and privation in childhood. Adults also are comparatively free from the inefficiency arising from minor ailments, such as colds, headaches and indigestion, and from the greater handicaps due to a host of more serious diseases. Moreover, the average person continues to be a productive member of society well into old age. This means that there is a large percentage of producers in comparison with the number of children and persons too old or feeble to work.

The more fully we investigate the subject, the more clear it becomes that physical vigor is one of the most basic of all elements in human progress. It is needed in order that people may work hard for long hours without undue fatigue, and may have a reserve of strength for emergencies. It is still more important because it promotes mental vigor. Only in exceptional cases can people who lack physical vigor have the alert minds and power of endurance which lead inventors, thinkers, reformers and other leaders to work for the love of the work, over and above the mere need of getting a living. Darwin has well said that man's chief trouble is not lack of talent, but failure to use those talents which he has. Physical vigor enables people to use their talents. One of the main elements in acquiring fame is the kind of mental alertness and power to persist in arduous work which permit people to make full use of their talents. This is rarely present except in people who are physically vigorous.

Table 3 shows the comparative vigor of thirty nations according to the best available data. It is based on health or longevity according to three standard criteria which eliminate differences due merely to the presence of many old people or children in one region and few in others. Differences due to race are also eliminated in the United States and South Africa. The three criteria have been treated in such a way that all have equal weights. The first criterion is expectation of life at birth. This means the average length of life which a newborn child might expect if throughout its life the deathrate at each age remained the same as at the time of birth. The two others are deathrates which have been inverted in such a way that they become health rates.¹ One of these is the standardized deathrate, that is the rate as it would be if the existing deathrates prevailed at each age level, and the percentage of the population at the ages of one year, two years, and so on up to one hundred were the same in all countries. For convenience the percentage at the different age levels as it was in England in 1901 is customarily adopted as the standard. The third method is the number of deaths among children under one year of age for each thousand births. This is a good measure of vigor because it is a test of the strength with which people start life, and also, to a less degree, of the health of women in the most important part of their lives.

¹ The method of inverting the deathrates into health rates and giving each of them the same weight as the expectation of life is as follows: The lowest deathrate among the countries for which data are available in each of the two types of mortality and the highest expectation of life are counted as 100. The highest deathrates are counted as equivalent to the lowest expectation of life, and the other deathrates and expectation of life are arranged in proportional intervals. For example, suppose that the maximum expectation of life is 60 years and the minimum, 36. Among the same countries, the minimum deathrate which corresponds to the maximum expectation of life is 10 and the maximum deathrate is 20. Then we get the following:

<i>Expectation of Life</i>		<i>Health Rate</i>	
<i>Years</i>	<i>Index</i>	<i>Deathrates</i>	<i>Index</i>
60	100	10	100
48	80	15	80
36	60	20	60

An expectation of life of 60 years and a deathrate of 10 are both given an index of 100. In the same way an expectation of life of 36 years is equivalent to 60 per cent as long a life as the maximum, and therefore, receives an index number of 60. For purposes of calculation, the lowest deathrate is counted as having an index of 100 and the highest deathrate as having an index of 60, the same as that of the lowest expectation of life. Intermediate values such as an expectation of life of 48 or a deathrate of 15 are given intermediate values in proportion to their size.

TABLE 3
*Index of Health and Vigor**

Rank in			Rank in			
Table 3	Table 1		Table 3	Table 1		
1.	(1)	New Zealand	100.0	16.	Scotland	86.2
2.	(8)	Netherlands	98.1	17.	Latvia	86.1
3.	(2)	Australia	97.6	18.	Finland	85.5
4.	(15)	Norway	97.1	19.	(17) Estonia	82.5
5.	(14)	Sweden	96.0	20.	Austria	82.5
6.	(11)	Switzerland	93.1	21.	Italy	80.5
7.	(5)	U.S.A. (Whites)	92.5	22.	(16) Czechoslovakia	76.7
8.	(6)	Denmark	92.2	23.	Greece	74.6
9.	(10)	England	91.7	24.	Hungary	70.2
10.		South Africa (Whites)	91.3	25.	(20) U.S.S.R.	(70.1)
11.	(9)	Germany	90.8	26.	(19) Japan	69.3
12.	(7)	Canada	90.2	27.	(18) Poland	69.3
13.		Ireland (Eire)	87.4	28.	Bulgaria	68.8
14.	(13)	Belgium	86.9	29.	Egypt	52.2
15.	(12)	France	86.5	30.	India	44.5

* Based on (a) Standardized deathrate, 1930-32, (b) expectation of life, 1932-34, or 1931-35, (c) Infant mortality, 1934-38. In (a) and to a less extent in (b) a little extrapolation or interpolation has been necessary, but this has no appreciable effect on the relative standing of the various countries.

Different dates have been employed for the three criteria so that the whole period from 1930 to 1938 is covered. The three methods have been combined in such a way that each has the same weight. This gives the index numbers of Table 3. New Zealand, the country where productivity per man on the farms is highest, excels in all three criteria. It has the greatest length of life, the lowest deathrate, and lowest infant mortality. Hence in Table 3 it receives a rating of 100, and the other countries are ranked proportionally. All three methods give essentially the same results, so that the index numbers of Table 3 are highly reliable.

The fact that New Zealanders have an index more than double that of India is especially important because it indicates a difference in desire for work as well as in capacity for work. Vigorous people prefer to work rather than sit idle. The will to work beyond the actual requirements of the job is extremely important in crises such as war, and also as a factor in making inventions and scientific discoveries, carrying out reforms, or producing works of art, literature and music. Because their vigor makes them feel like doing something, the New Zealanders probably do much more than twice as much work as the people of India.

The order of the countries in Table 3 is most interesting, especially when compared with the order in Table 1 as given in the second column. Australia joins New Zealand near the top in both cases. The United States, however, is surpassed in vigor not only by New Zealand and Australia, but

by four small countries of western Europe, namely the Netherlands, Norway, Sweden, and Switzerland. Canada is surpassed by four more, namely Denmark, England, South Africa (whites only), and Germany.

Consider the quality of the countries as we pass downward in Table 3. General opinion and statistics agree in indicating that New Zealand and Australia furnish especially good soldiers. In both world wars the "Anzacs" have been conspicuous not only for skill and daring, but for originality and resourcefulness. We think of New Zealand and Australia as primarily agricultural, but during World War II they have gone ahead by leaps and bounds in manufacturing. Neither country is remarkable in its supply of raw materials or fuels, and both are remote from neighbors. Nevertheless, New Zealand makes textiles of high quality, and Australia now manufactures motors, naval vessels, and even machine tools which are the top notch in industrial activity. In addition to all this, these countries are especially progressive in their legislation, and maintain a remarkably high level of comfort and progress with very few of the submerged type of people. In general they stand close to the top in human progress. Thus in the antipodes we have a striking illustration of superb health and high vigor associated with extremely high productivity as well as with other qualities which make a country progressive. How far the good health is a result and how far a cause of the other conditions remains to be seen.

The Netherlands, Norway and Sweden, which almost rival New Zealand in Table 3, enjoy conditions of health about like those of Australia. By almost universal consent these countries stand extremely high in the main elements of civilization. As opponents of Germany, to be sure, they cut a sorry figure in 1940, but this was not due to lack of individual capacity. An army of Swedes, Norwegians or Dutchmen, armed and equipped like the legions of Hitler, would presumably be at least as effective as an equal number of Germans.

Below Sweden in Table 3 a drop from an index of about 96 to a level between 90 and 93 brings us to a most significant group of seven countries with essentially the same degree of physical vigor. Switzerland heads this group and the white population of the United States comes next. If colored people are included, this country drops a little, but only to the level of Canada. The progressiveness and high capacity of Switzerland need no comment. The fact that it retained its independence and neutrality during both world wars shows the importance of a mountainous geographical environment in helping a country to maintain political integrity, but it also shows the importance of certain human qualities which will be mentioned later. The ease with which the easily accessible lowlands of Denmark were taken over by Hitler also illustrates the political effect of the form of the

earth's surface, but it may also illustrate human qualities which deserve to be called national traits.

It is somewhat surprising to find that the white people of South Africa are physically as vigorous as those of Great Britain and Germany. The climate there, though good, does not appear to be so healthful as in the two great European countries. Parts of Canada, Australia and the United States also suffer from climatic handicaps. The fact that each of these regions taken as a whole ranks practically as high as England, and higher than Ireland and Scotland, suggests that the innate constitutional vigor of colonial people may be greater than that of their home countries because migration exerts a selective action. People who are physically weak are not likely to migrate. This is especially true of women. The more difficult the migration, the more pronounced is the selection. This may be one of the main reasons why the newly settled countries rank high in health as well as in other respects.

One of the most significant facts about Table 3 is that the United States, England, and Germany all display practically the same degree of physical vigor. In this respect, as well as in agricultural and probably industrial productivity per man the difference between these chief antagonists in World War II is negligible. If England and Germany alone were pitted against one another, victory would apparently not depend on differences in human vigor, but upon such factors as number of people, degree of preparedness, and geographical advantages for defense, offense, and the supply of food, raw materials, and munitions from abroad.

Below Canada in Table 3 there is a drop of three points to the first of twelve countries (nos. 13 to 24) which may be called satellites of World War II. The first six of these, Ireland, Belgium, France, Scotland, Latvia, and Finland, show a maximum difference of less than two per cent. They appear to be practically identical in the vigor of their people. Would they be equal in their powers of defense and offense if they were alike in numbers, preparation and geographical advantages? And how would they compare with the countries higher up in the list? The answers to these questions are thus far largely a matter of personal opinion, but a few impressive conditions may be pointed out. The Scotch are popularly supposed to be a particularly tough people physically. This may be true so far as innate constitutional qualities are concerned, but the rate at which they die shows that something is wrong. In Table 3 they are 12 points below the Dutch, 5 below the English and somewhat more below the northwestern part of Germany, which appears to be intermediate between Denmark and the Netherlands. Belgium, in spite of its extremely favorable geographical location, stands at the same level as Scotland.

The differences in vigor between Scotland and Belgium, on the one hand, and their near neighbors, England, the Netherlands, and northwestern Germany on the other hand, are much too great to be explained on the basis of race or any direct geographic factor such as maritime location, climate or relief. They can scarcely be due to degree of industrialization and urbanization, for in these respects there is little difference. In all five countries about 41 to 43 percent of the employed men are engaged in industry. In Switzerland, however, where the percentage rises at 46, the index of health (93) is higher than in any of the countries now under discussion except the Netherlands. The employment of women presents a slightly different picture. Only 7 per cent of the women who might be engaged in gainful occupations are normally employed in the Netherlands, whereas the percentage is 13 in Belgium and Germany, 15 in Scotland and 16 in England. This may be a factor in the vigor of the Netherlands, but it does not help much in explaining why Belgium and Scotland stand low compared with England and northwestern Germany. Another possibility is that the preponderance of iron and steel industries with their smoke, grime, and low standards of living tend to diminish vigor. An unusually large percentage of the people of both Belgium and Scotland live in the immediate vicinity of such industries. Another possibility which ought at least to be considered is that excessive migration from Scotland has removed many of the more vigorous people. The Scotch have migrated overseas, and also to England in great numbers, but this does not apply to Belgium.

Turning back again to Table 3, we find France at the same level as Scotland and Belgium. This level, of course, is high compared with that of the world as a whole, and so are the abilities of the French. Nevertheless, one wonders what would have happened in 1940 if the vigor of France had been equal to that of the Netherlands. Would the extra vigor have led the French to a more progressive method of preparing for war? Would they have seen as Germany did, that the growth of motor transport and aviation had completely changed the conditions of war between 1918 and 1939? Perhaps both France and Belgium are handicapped by the ravages of war including the Napoleonic Wars and especially World War I with its immense loss of life and its hardships at the time when the generation of people now in the prime of life was growing up.

Just as Scotland's rank is rather lower than many people would have expected, so that of Latvia and Finland is higher. Since World War I the world has learned that Finland is one of the most advanced nations. Its payment of its debts underlined this, and so did its fight against Russia in 1939. Equally convincing evidence is found in the orderly and beautiful way in which Finland builds its cities, and the skill with which a good living

is wrested from poor natural resources. Much the same is true of Latvia with its beautiful city of Riga.

Well below Finland in Table 1 we find five of Hitler's easiest victims. Austria fell without a struggle. Estonia would perhaps stand between Latvia and Finland in human vigor as well as in geographical location, if more of its people lived in the healthful coastal cities instead of the interior. Italy, Germany's Axis partner, is looked upon with ill-concealed contempt by the Germans. In neither world war did the Italians gain military glory. They themselves attribute this to lack of preparation, lack of resources, and similar causes. It is hard to say how much is due to this, how much to innate national traits, if there are any such things, and how much to lack of physical vigor which there certainly is. A rank of 80.5 in Table 3 is, of course, excellent compared with oriental and tropical countries, but it puts Italy well toward the bottom among advanced countries.

Czechoslovakia, Greece, and Hungary, which in one way or another succumbed to Germany with remarkable ease, appear to have an endowment of human vigor well below that of Italy. This might be expected in Greece, but the position of Czechoslovakia and Hungary may surprise many people. Western Czechoslovakia approaches the Austrian level, but the east apparently falls well below Poland. The difference in vigor between Austria (83) and Hungary (70) is extraordinary in view of the geographical proximity of the two, but it is not much greater than between the Netherlands (98) and Belgium (87), or Norway (97) and Scotland (86). The falling off in vigor from Austria to Hungary is part of a general rapid decline toward the east. Germany (91) and Poland (69) offer a similar, but even greater contrast. Bulgaria (68) adds another step of the same kind. Then going south, we come to Egypt at the low level of 52. Tropical countries, as illustrated by India (45) bring up the rear.

The position of Russia (70) and Japan (69) in Table 3 is especially significant. Both countries have long been eagerly watched because of their ambition to place themselves in the front rank of progress and military power. Opinions differ widely as to how far they have succeeded. The low level of both countries in agricultural productivity per man as shown in Table 1 agrees with many other statistical facts in showing that they have been only partially successful. Inasmuch as this article is written during the height of the World War it is too early to attempt a final estimate of the military capacity of these two countries. When the war is over it will be most interesting to see how nearly the final record agrees with what would be expected on the basis of the data given in this article. It seems to the author that thus far their records indicate that they stand just about where the index numbers in Table 3 would indicate. Russia and Japan are ener-

getic compared with tropical countries such as India, but they are less vigorous than the Anzacs, Swiss, British, or Germans.

D. *Diet and Physical Vigor*

The remarkable vigor of the United States and of the six small countries which outrank it in Table 3 is doubtless due to a combination of factors. Diet, medical care, wealth and constitutional inheritance, as well as climate, all presumably play a part. Omitting climate for reasons already given, let us see how the United States compares with other countries in the other respects. The importance of diet is dinned into our ears on every side. Millions of people can testify to improved health, better work and greater happiness because of more fresh vegetables and fruit than they ate in their youth. Oranges, milk, eggs, and fresh vegetables are among the great blessings of modern civilization. They drive away constipation, anemia and headaches; they banish old-fashioned diseases such as gout and dyspepsia, and they increase our resistance to hundreds of other ailments.

The main essentials of a good diet are that it be abundant, and contain the right proportions of carbohydrates, fats, and proteins, on the one hand, and of the protective foods (milk, meat, eggs, fresh vegetables, and fruit), on the other. Even in the most favored countries many people are undernourished; in regions such as India and China undernourishment and anemia are chronic among almost half the inhabitants. There is not enough arable land to raise sufficient food, and the people have no means of obtaining money with which to buy from outside. Sad as this state of affairs may be, it probably does less harm than deficiency in the protective elements of diet. This deficiency unfortunately is greatest just where it does most harm. Tropical soils as a rule, although with marked exceptions, are so badly leached and so poor in humus that the crops which grow in them are in general not so well supplied with either minerals or vitamins as are those of cooler climates. According to an investigation carried on for the United States Department of Agriculture by Stiebling and Ware,² a diet is not really well balanced unless at least 53 per cent of its calories are derived from the protective types of food. Such a diet requires three or four times as much land and labor as a diet composed mainly of corn and beans, for example. In over-populated countries there is not space enough to raise such a diet. What little land a farmer has must be devoted almost exclusively to the crops which will supply at least a fair amount of protein in addition to carbohydrates. In India, China, and Japan, and even among the poorer people in many European countries the farmer who devotes an acre or two of land to

² Hazel K. Stiebling and Medora M. Ware: Diets at Four Levels of Nutritive Content and Cost. *U. S. Dept. Agric. Circ.* 296, Nov. 1933.

fresh vegetables and fruit to be used by his family, or who raises cows so as to have a steady supply of milk for his children, runs the risk of finding that he has not enough wheat, rye, rice, potatoes, or dry beans to keep his family well supplied with calory-producing foods throughout the winter. Or if he raises fruit, vegetables, milk, and eggs he feels obliged to sell most of them to the more prosperous city people. If his family eats them, there will be no money with which to pay for clothes, tools, and taxes. Hundreds of millions of farm families are forced to base their crops and their diet upon the assumption that the order of importance in diet is, first, a full stomach, second, a good proportion of proteins, and only third, a fair supply of the protective foods that furnish vitamins, acids, and minerals. Sometimes this order and the consequent failure in the third respect are due to lack of land, and sometimes to the shortness of the growing season and the consequent inability to cultivate more than a few acres or raise more than a small crop per acre. Sometimes they are due to the fact that poor soil or a dry climate leads to such poor yields per acre that a large area has to be cultivated in order merely to raise enough of the main starchy foods and proteins. In many regions this failure to raise the protective types of food is due to factors of still another type, namely inertia and disinclination to work because of a debilitating climate, or because of a poor diet which would be remedied if the farmer felt more like work.

Some idea of the costliness of a good diet may be gained from the following figures showing the relative cost of getting a given number of calories of energy from other foods in comparison with wheat in the United States, or rye in Germany.³ On a calory basis, potatoes, rye, corn, and millet cost less than wheat, whereas most kinds of fruit and vegetables cost more than cabbage.

TABLE 4
Index Numbers of Relative Cost of Types of Food

	United States	Germany
Wheat or rye	100	100
Lard	124	165
Sugar	143	135
Milk	800	300
Inferior cuts of meat	1100	1000
Eggs	1500	900
Cabbage	1700	1000

It is clear enough that the United States has a diet far better than that of India or China, but how can we make a statistical comparison with countries such as Germany and France? The best way seems to be to find out

³ M. K. Bennett: *Wheat in National Diets*, 1940.

how much of the diet consists of the protective foods. The statistics are by no means so accurate as those for the cereals and potatoes, but they at least give a correct general picture. Better statistics will not be available until the world settles down to peace after World War II, but before that war broke out some attempt had been made to estimate the diet of one nation compared with another. We shall use three methods. First, the League of Nations has published tables giving the per capita consumption of five main types of protective foods. These show, for example, that the annual consumption of milk in all forms, including butter and cheese, ranges from about one gallon for the average person in Japan to 20 in Rumania, 50 in Poland, 80 in the United States, Belgium, and Germany, and 144 in Finland. Meat runs all the way from only a pound or two per person each year in much of India to 35 in Italy, 80 in Sweden, 135 to 140 in Great Britain and the United States, and 236 in New Zealand. Eggs show a similar variation from 40 or so per year in Egypt and Russia up to 100 in Holland, more than 200 in the United States, 300 in Canada, and actually 400 in Ireland. The figures for fruits and vegetables are not so accurate as for animal products. Nevertheless, we have such facts as these; practically no bananas are imported into Russia in normal times in contrast to about 10 pounds per capita in France, 15 in England, and 30 or so in the United States. The average person in the United States including all ages uses about 150 pounds of fresh vegetables each year and about 200 pounds of fruit, whereas in Italy the corresponding figures are about 40 and 90, and in India much less.

Another method of measuring diet is set forth by Colin Clark in *The Conditions of Economic Progress*. For the latest years available he has calculated the value of the average diet per person if prices everywhere were the same as in England from 1925 to 1934. The values range all the way from \$22 in Japan and \$23 in the U.S.S.R. to \$88 in Argentina, where abundant meat greatly raises the level. India and especially China fall considerably below Japan. The United States stands at \$64, on a par with Australia and slightly above France and Switzerland. Anything above \$60 is considered ample. Inasmuch as the average value of a year's food in the Scandinavian countries, Great Britain and Germany ranges not far from \$50, those countries are not sufficiently well fed. Argentina (\$88), New Zealand (\$81), Uruguay (\$77), and Canada (\$76) rank very high because they consume a great deal of meat.

Some idea of the nature of the different kinds of diets can be gained from Table 5, which shows the relative cost of the various types of food entering into the diet of six classes of people in England. Class I comprises the poorest 10 per cent of the population, Class VI the wealthiest 10 per cent, and each of the other classes contains 20 per cent. The ratios in the last column

show how the consumption of different types of food by Class VI compares with that of Class I. The prosperous, well-fed people of Class VI eat only 91 per cent as much wheat and other cereals as the poor people of Class I, but they eat fruit and vegetables which cost more than seven times as much (7.20).

TABLE 5

Diet of Economic Classes in England
Approximate farm cost of food for one person for one year in dollars

	I	II	III	IV	V	VI	Ratio I/VI
Wheat products, cereals	3.4	3.5	3.5	3.5	3.4	3.1	0.91
Potatoes	2.6	2.7	2.8	2.8	2.8	2.6	1.00
Sugar	1.9	2.2	2.5	2.7	2.8	2.9	1.52
Tea, etc.	2.1	2.6	2.8	2.9	2.8	2.6	1.24
Total non-protective foods ..	10.0	11.0	11.6	11.9	11.8	11.2	1.12
Milk and milk products	6.9	12.7	14.8	16.8	19.2	21.9	3.18
Meat	12.4	16.8	19.8	22.3	24.2	26.4	2.12
Eggs	1.4	2.0	2.5	3.0	3.4	4.3	3.07
Fruits and vegetables	2.1	3.8	5.6	7.8	10.3	15.1	7.20
Total protective foods	22.8	35.3	42.7	49.9	57.1	67.7	2.96
Grand total	32.8	46.3	53.3	61.8	68.9	78.9	2.40

Number IV in this table represents approximately the average for the United States; Great Britain and Germany fall between II and III; Poland and Czechoslovakia are intermediate between I and II. In Japan and Russia the average level of diet falls below the level of the most poorly fed 10 per cent in England (I). In India and China, the conditions are still worse. There the non-protective foods probably have about the same value per person as in England, but the protective foods probably fall to only \$5 or \$10 on an average, not more than half as much as among the most poorly fed ten per cent in England. It will be noticed that in England the value of the non-protective starchy foods is about the same for all economic classes, but reaches a slight maximum in Class IV. That class represents people who are comfortable but not well-to-do. Among people with more money, the consumption of non-protective foods actually declines. It is almost impossible for the average well-fed American to realize how inefficient he would feel if instead of sixty dollars' worth of protective foods per year, he always had to be content with five or ten dollars' worth, as in China or India.

Still another method of determining the value of the diet in different parts of the world has been used by Bennett in the valuable studies of food carried on at Leland Stanford University.* Exact investigations have shown

* M. K. Bennett: *Wheat in National Diets. Wheat Studies*, Vol. XVIII, No. 2, 1941, 40 pp.

that the amount of food consumed by the average man at ordinary work differs considerably from country to country. Here are some samples expressed in calories; Java, 2607; India, 3122; Italy, 3709; Great Britain, 3965; the United States, 4022. The amount varies according to the size of the people (their stature and weight), the climate, and the degree of wealth. Knowing the general conditions in these respects, Bennett has given each country a rating according to the approximate number of calories of food in the normal diet of an adult man at moderate labor. Then he has made allowance for the fact that women and children eat less than men, and has found how many calories are presumably consumed in each country. Inasmuch as good statistics are available for the non-protective foods (chiefly cereals and potatoes), the number of calories which they provide can easily be determined. The difference between this figure and the estimated total requirement must consist almost entirely of protective foods together with sugar and vegetable oils. The percentage of the diet formed by these non-starchy foods, which are neither cereals nor potatoes, provides a rough measure of the quality of a diet. This method has the advantage of being free from reliance on the very imperfect and incomplete statistics for fruit and vegetables which frequently necessitate reliance on estimates when the other methods are employed. It has the disadvantage of relying on equally imperfect estimates as to the calories supplied by the average diet in most countries.

In order to get the best possible estimates of diet in the world as a whole the three methods described above have been combined in Table 6. From the data supplied by the League of Nations, two sets of index numbers have been calculated. One is based on milk, meat, and eggs, for which the statistics are fairly good; the other on these three types of food plus fresh vegetables and fruits, for which the statistics are poor. The methods of Clark and Bennett have each been used for a similar set of index numbers. Fortunately all four sets show essentially the same general conditions, although there are discrepancies in detail. Table 6 gives the results when the four are combined in such a way that each has approximately the same weight.

This table is most significant. Four new English-speaking countries are better fed than any other parts of the world. If diet alone determined vigor for either war or peace we might expect New Zealand, Canada, the United States and Australia to show the greatest energy. One other new country, Argentina, also stands high, and Uruguay may come in the same class, but in both countries meat plays too large a part in the diet in comparison with vegetables and fruit. The fact that Great Britain, as well as Switzerland, follows close after Australia makes it clear that under normal conditions the English-speaking parts of the world hold an almost unrivalled position in diet. The next seven countries (Nos. 8 to 14) form a compact group along

TABLE 6

Index Numbers of Diet

Numbers in parenthesis indicate how many of the four types of index numbers are available when one or more is missing

America and Oceania	Europe	Asia and Africa
1. New Zealand ... 100		
2. Canada 97		
3. United States .. 92		
4. Australia 92		
7. Argentina (2) .. 80	5. Switzerland 86	
	6. Great Britain ... 83	
	8. Sweden 78	
	9. Belgium 76	
	10. Denmark (3) ... 75	
	11. Norway (3) 74	
	12. Germany 71	
	13. Netherlands 70	
	14. France 70	
	15. Austria (3) 68	
	16. Finland 68	
	17. Czechoslovakia .. 66	
	18. Ireland (1) 61	
	19. Estonia (2) 59	
20. Mexico (1) 57		
21. Chile (1) 56	22. Italy 47	
	24. Bulgaria (3) 42	
	28. Rumania (2) 26	
	30. U.S.S.R. (2) 26	
		23. Algeria (1) ... 44
		25. Egypt (1) ... 36
		26. Japan (2) 29
		27. India (1) 29
		29. Java (1) 26
		31. Philippines (1) 21
		32. China (2) 17

the west coast of Europe from France through Belgium and Holland to Scandinavia. These, as well, as Britain, are countries where the climate is especially favorable to cattle, so that milk is abundant and there is a good supply of meat. Vegetables grow well in the more southern parts.

Below France in Table 6 we find five countries which hang on the outskirts of the preceding group and have climates with greater extremes of one sort or another. Hence they are not so favorable to a wide range of protective foods. Austria and Czechoslovakia are excellent for fruits and vegetables but are not quite such good cattle countries as the Netherlands, for example. Finland and Estonia are too cold for great production of fruit and vegetables; Ireland is too wet and cool for fruit and for many kinds of vegetables. Farther down in Table 6 it is somewhat surprising to find Mexico close to Estonia and Ireland. It is still more surprising to find it

above both Chile and Italy, but as its estimate of diet is based on only one type of index number, its true position is doubtful.

The low position of Italy and still more of Rumania and Russia in all the tabulations on which Table 6 is based leaves no doubt as to the reality of the poor diet in those countries. The nutritive value of the Italian diet corresponds roughly to that of the next to the lowest economic class in England. Rumania and Russia, as a whole, fall below the lowest class in England. They actually fall below Japan in spite of the intense over-crowding of the latter country. To find a parallel in the United States we must go to our most poorly fed five per cent. The trouble, of course, is not so much deficiency of food, but the monotonously poor quality—bread, potatoes, tea and not much else many months each year. One of the chief reasons for Russia's poor diet is that cold winters and short and often droughty summers make it difficult to raise both fruits and vegetables. Another reason is that in spite of the common opinion to the contrary, both Russia and Rumania are over-populated agriculturally. On an area of cultivated land not much larger than that of the United States, the U.S.S.R. has four times as many farmers. The land there, on an average, does not yield as much per acre as that of American farms, nor can it be made to do so without expensive and revolutionary changes in agricultural methods. If the Russians attempt to cultivate a larger area than at present, they will have to use land where the yield per acre is even smaller than now. Such facts help to explain the extremely low agricultural productivity per man in Russia as shown in Table 1.

E. Comparative Development of Medical Science

Medical care as well as diet has much to do with the health and vigor of a country. In the publications of the League of Nations and in national yearbooks and censuses, fairly complete statistics are available for doctors, dentists, and hospital beds. There are also statistics for nurses, but the definition of nurses varies so much from country to country that we shall not consider them. The index numbers of Table 7 are based on the number of doctors, dentists and hospital beds in comparison with the population. Dentists and hospital beds have been given the same weight as physicians because they are highly significant as evidence of the degree to which the general health of the public is protected. Data later than 1930 are generally not available, because the publication of the censuses of 1940 and 1941 has been interrupted by the war.

Most parts of this table are about what one would expect, but others are surprising. New Zealand and the United States stand at the top. If nurses are included the United States outranks New Zealand. For the other two English-speaking new countries, Canada and Australia, data are not avail-

able. Scotland maintains a position like that attained by Great Britain in diet, but England (No. 10) falls far lower. This is especially curious in view of Scotland's poor showing in mortality (Table 3). It looks as though the Scotch were so intelligent that they realize their physical deficiency, and make a special effort to counteract it. England also falls behind Germany (No. 4). This is due to scarcity of hospitals. England is nearly as well off as Germany in physicians and better off in dentists, but hospital beds are relatively only one-third as numerous as in Germany. If nurses are included, England improves its position, but even so it falls well behind both Scotland and Germany. This is surprising in view of the fact that in vigor, as measured by longevity in Table 3, England not only excels Scotland, but is somewhat superior to Germany.

TABLE 7
Index of Medical Care
Based on Physicians, Dentists and Hospital Beds, 1930

1. New Zealand	100	14. Netherlands	50
2. United States	94	15. Eire (Ireland)	46
3. Switzerland	87	16. Czechoslovakia	45
4. Germany	86	17. Hungary	45
5. Scotland	85	18. Japan	40
6. Denmark	76	19. France	37
7. Latvia	75	20. Finland	32
8. Norway	60	21. Bulgaria	23
9. Sweden	60	22. Poland	21
10. England	59	23. U.S.S.R.	20
11. Belgium	58	24. Egypt	10
12. Estonia	57	25. India	9
13. Austria	56		

Another surprising fact is that in medical facilities Estonia appears to outrank the Netherlands. The Dutch appear to be so healthy that they have not yet thought it necessary to devote great attention to medicine. Japan's position above France and twice as high as Russia is another astonishing fact. India and Egypt fall where one would expect. China would presumably stand lower than India if data were available. On the whole the conditions of medical care, or at least the numbers of physicians, dentists and hospital beds, do not show so close a relation to the vigor of nations as would be expected.

F. *Relative Income as a Factor in Human Vigor*

Although the income of a country is influenced to a considerable degree by the vigor and productivity of the inhabitants, it also has a reciprocal effect upon those conditions. The net income per person is the best available index

of a country's standard of living. Of course income depends on productivity, but the two are quite different. A farmer who produces 3,000 dollars worth of products may have a net income of only half as much because he hires help, pays interest on a mortgage, rents a truck to haul his grain, and loses a horse and two cows through disease. Moreover, our data for income, being based on primary, secondary and tertiary production, cover a much wider field than those on which productivity is based in Tables 1 and 2. Forestry, mining, and fishing are placed with agriculture to form primary production. Industry constitutes secondary production. Tertiary production includes the value of all sorts of services which raise the standard of living, but do not actually produce new goods. Transportation, recreation, education, and government are factors in tertiary production. So is the work of telephone companies, garages, doctors, clergymen, and scientists. The more prosperous a country is, the more it can afford to pay for such work. Many of the services included under tertiary production increase the productivity of primary and secondary production and improve diet and health.

The connection between tertiary industry and the degree of health, productivity and progress in a country is close, as is indicated in Table 8. There, column A shows the average annual income per capita in dollars, and column B shows the percentage of the working population engaged in tertiary industry. Only countries which stand close to the top in income per capita, as well as in the other conditions discussed in this paper, have a percentage of tertiary workers above 40. On the other hand, percentages below 20 are found only in countries which stand far down in the scale of income.

The best data for national income are those of Colin Clark in *The Conditions of Economic Progress*. They are based on averages for the decade 1925 to 1934, which was about equally divided between prosperity and adversity, thus giving a fair average. Because of World War II, data later than 1937 are not available for many countries. In Table 8, Clark's estimates of income have been recalculated so as to express them in "international units" per person in the entire population. Such a unit is the amount of goods and services which one dollar would have bought in the United States on an average during the years 1924 to 1935. Allowance is made for differences between one country and another in the prices of different kinds of commodities, such as food, fuel, rent, machines, and luxuries. Thus Table 8 gives an approximate picture of the degree of comfort in which

TABLE 8

Annual Income Per Capita in Dollars (A), and Percentage of Working Population in Tertiary Occupations of a Non-Military Type (B)

Part I—Countries of the World

After Colin Clark with a little modification

America and Oceania		Europe		Asia and Africa	
A	B	A	B	A	B
1. United States a	541 49				
2. Canada .....a	515 42	3. Great Britain a	477 49		
		4. Switzerland ..d	472 33		
5. New Zealand b	465 48				
6. Australia .....a	397 46	7. Netherlands ..b	336 40		
		8. France .....b	302 33		
		9. Denmark .....a	286 36		
		10. Sweden .....a	285 38		
		11. Eire .....b	281 32		
		12. Germany .....a	274 37		
		13. Belgium .....c	252 33		
		14. Austria .....c	240 36		
15. Argentina	228 34				
16. Uruguay	217 ..	17. Norway .....a	216 38		
		18. Czechoslovakia d	183 26		
19. Chile?	158 32	20. Greece .....c	146 21		
21. Brazil	145 ..	22. Finland .....b	140 18		
		23. Hungary .....a	140 21		
		24. Spain	136 16		
		25. Latvia	131 22		
		26. Italy .....c	128 26		
		27. Estonia .....a	127 21	28. Philippines ..?	125 ..
29. Mexico?	120 ..			30. Palestine	120 25
31. Martinique ..?	117 ..	32. Poland .....c	112 16	33. S. Africa ....b	111 ..
		34. U.S.S.R. ....c	101 9	35. Algeria	100 ..
		36. Yugoslavia ....d	99 ..	37. Egypt	99 ..
		38. Portugal .....c	98 ..		
		39. Bulgaria .....c	90 14	40. Japan .....b	91 27
				41. Belgian Congo ?	87 ..
		42. Rumania .....d	84 ..		
		43. Lithuania	81 18	44. Turkey	78 11
				45. Spanish Morocco	73 ..
				46. Syria	67 ..
				47. Br. India*	65 22†
				48. Gold Coast ..?	60 ..
				49. Rhodesia	53 ..
				50. China	51 ..
				51. Tanganyika ...	47 ..
				52. Fr. W. Africa	43 ..
				53. Ceylon	33 ..
				54. Malaya	30 ..
				55. East Africa ...	25 ..

* Omitting Native States.

† If servants are omitted this becomes 12. No other country except Norway classifies so many of its workers as domestic servants.

TABLE 8—(Continued)

*Annual Income Per Capita Reduced to a Common Denominator Based on 1925-1934
Part II—The United States (1929 Income as estimated by the
Brookings Institute reduced by 22%)*

States of the United States	Countries of America and Oceania	Countries of Europe
1. New York 935		
2. California 788		
3. Nevada 749		
4. New Jersey 722		
5. Illinois 713		
6. Connecticut 683		
7. Massachusetts 675		
8. Michigan 628		
9. Rhode Island 627		
10. Washington 620		
11. Wyoming 597		
12. Pennsylvania 582		
13. Ohio 579		
14. Oregon 575		
15. Maryland 566		
16. Arizona 550	17. United States .. 541	
18. Montana 528	19. Canada 515	
19. Colorado 515		
20. Wisconsin 508		
21. Missouri 478		
22. New Hampshire .. 478		23. Great Britain .. 477
25. Maine 471		24. Switzerland 472
26. Idaho 470		
27. Vermont 469		
29. Indiana 463	28. New Zealand .. 465	
30. Minnesota 451		
31. Utah 450		
32. Kansas 430		
33. Florida 404	34. Australia 397	
35. Nebraska 396		
36. Texas 394		
37. Oklahoma 374		
38. Iowa 367		
39. West Virginia 366		
40. New Mexico 362		
42. Louisiana 332		41. Netherlands 336
43. Virginia 326		
44. North Dakota 326		
45. South Dakota 318		
47. Kentucky 292		46. France 302
		48. Denmark 286
		49. Sweden 283
		50. Eire 281
		51. Germany 274
52. Georgia 261		
53. Tennessee 259		
55. Alabama 251		54. Belgium 252
56. North Carolina .. 242		57. Austria 240
58. Arkansas 238	59. Argentina 228	
60. Mississippi 238	61. Uruguay 217	
63. South Carolina ... 200		62. Norway 216

the average family lives. Accurate data based on census returns or figures for taxation are indicated by *a*; *d* means very rough estimates based on partial returns for production, *b* and *c* are intermediate. The absence of a letter indicates that the estimate is based on indirect evidence such as wages. A question mark suggests that a considerable part of the national income goes abroad to foreign owners of mines, plantations, and public utilities, so that the actual condition of the people is not so good as the figures would indicate.

Table 8 tells its own story so clearly that little comment is needed. In Part I the English-speaking countries again stand at the top along with Switzerland. In the last few years New Zealand has improved its position so much that it now rivals or excels the United States. In normal times the average income in Germany (No. 12 in the table) is about half as great as in the United States, and in Italy (No. 26) only one quarter. The Italian in turn is twice as well off as the average inhabitant of India (No. 47). Even the Hindus appear on an average to have more than twice the income of the natives of East Africa (No. 55), but scores of millions of them are no better supplied with worldly goods than are the almost naked savages of East Africa.

Table 8 becomes still more impressive when we examine Part II. Here the states of the United States are compared with the upper section of Part I. The data for the states are based on the Brookings Institute's estimates of per capita income in 1929, but have been reduced so that the average for the country as a whole is the same as Clark's average for 1925 to 1934. They show that no less than 22 states enjoy an average income superior to that of Great Britain. Only 7 fall below the level of Germany. The poorest state is about as well off as Norway, better off than Czechoslovakia, and twice as well off as any part of Africa. California has about ten times as great an average income as Turkey, Lithuania, or Rumania. In the whole of Europe no country is as well off as 22 of our states which have a combined population of seventy-five million. Such an income means plenty of capital, not only for improved equipment in both primary and secondary production, but for scientific investigation, education, recreation, medical service and other means of increasing national vigor and intelligence. In view of such conditions, it is not surprising that the people of the United States are well fed, have a superb medical service, enjoy long and vigorous life, and are highly productive. The surprising thing is that poorer countries, such as those of Scandinavia, where limited natural resources curtail production and income, rival the United States in vigor. This agrees with other facts in suggesting that either biological inheritance or climate plays a large part among the conditions which influence health and vigor.

One of the most impressive and indeed ominous facts about income is the high proportion of the world's population in the lower brackets. This is illustrated in Figure 1. There, each continent is represented by a special

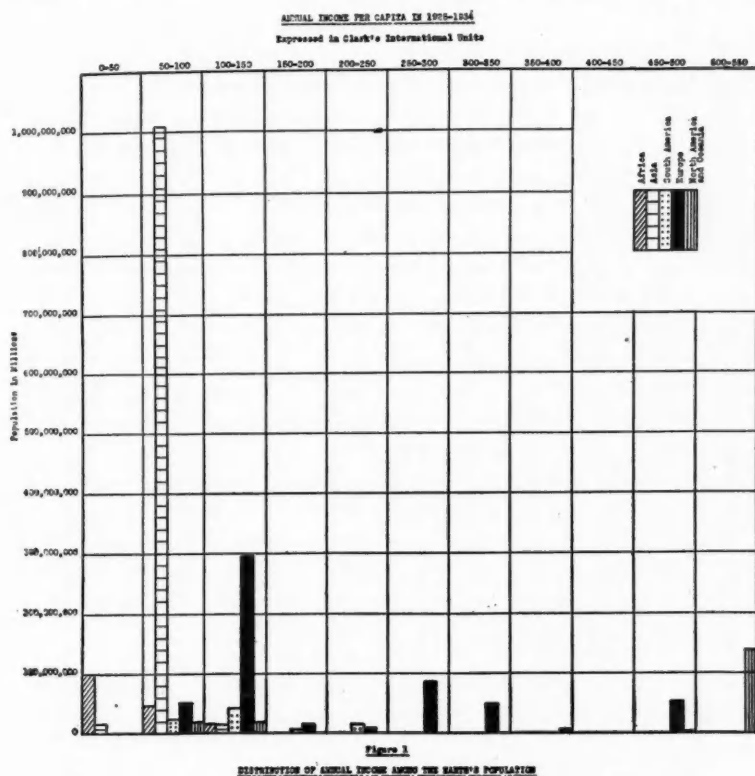


FIG. 1.—Distribution of annual income among the earth's population.

type of shading. On the basis of average annual income per capita all the countries of the world are divided into 11 groups, the lowest with incomes under \$50 and the highest \$500 to \$550. The bars indicate the total number of inhabitants in all the countries of each continent that fall within any group. Thus on the left about 100 million people in tropical Africa live in countries where the average income is less than fifty dollars per year. In Asia less than twenty million people, the inhabitants of Ceylon and Malaya, are included in this low group. Actually there are many more, in India and China, for example. These, however, are included in the next group, be-

cause the averages for their countries as a whole fall there. No countries in South America, Europe, North America, or Oceania, which is placed with North America, have an average income as low as \$50, although millions of individual families are as poor as that.

The next two groups include the bulk of the earth's inhabitants. Africa and Europe each have about 50 million people in countries with average incomes of \$50 to \$100 per year. South and North America (including Oceania) each have about 20 million; Asia, on the other hand, has more than 1,000 million, half the earth's inhabitants. India, China, and Japan all fall in this group, as well as other countries which can readily be picked out in Table 8. The next higher group, with average incomes of \$100 to \$150, is represented by 20 to 50 million people in each of the other continents, but by almost 300 million in Europe. This vast mass of people is found entirely east of Sweden and Germany, and south of Germany, Switzerland and France. In Asia it includes only the Asiatic part of the U.S.S.R. Thus the three lower brackets, with incomes of less than \$150, include the entire continents of Asia and Africa and much more than half of Europe. They include four-fifths of the world's population. Eight more brackets remain for the other fifth. Four of them are almost empty. Then we find the greater part of western Europe—France, Germany, the Low Countries, Eire, and most of Scandinavia—with incomes of \$250 to \$350. These countries are two or three times as well off as most of the world. Finally the two highest brackets include only Great Britain and Switzerland in Europe, and the United States, Canada, and New Zealand representing the New World. The contrast between these upper brackets and the two with incomes from \$50 to \$150 is one of the profoundest of all geographical facts.

G. *Patents as an Index of Productivity*

Having surveyed physical vigor, diet, medical care, and income as factors in promoting high productivity, we must next inquire into the part played by mental and intellectual conditions. It is extremely hard to estimate these statistically. Inventiveness is an excellent indication of mental vigor and initiative. It is especially important in relation to war, because inventive nations are likely to improve their weapons and devise new tricks to overcome their enemies. If patents were granted under uniform conditions in all countries, they would be a good indication of inventiveness, or rather of the extent to which the inventive faculty is actually exercised. Unfortunately some countries grant patents very easily, while others impose many difficulties. In 1925, to quote figures published by Jefferson,⁵ Germany

⁵ Mark Jefferson: *The Geographic Distribution of Inventiveness*, *Geogr. Rev.*, Vol. 19, 1929.

granted only 22 percent of the applications for patents received there, while the United States granted 60 per cent, France 90 and Belgium 99. The first four years of a patent cost \$24 in England and only \$5 in Belgium; the whole life of a patent cost \$636 in England (16 years) and only \$79 (10 years) in Belgium. Hence the quality of patents is likely to be higher in England than in Belgium. It does not pay to patent a minor idea in England. Realizing, then, the imperfections of our data, let us examine Table 9 which shows the number of patents per million inhabitants granted to people of various nations in their own countries and abroad.⁶

TABLE 9
Patents Granted At Home and Index Numbers of Patents Granted Abroad per Million Inhabitants, 1925

	A	B	C		A	B	C
	At Home	Abroad	Total		At Home	Abroad	Total
1. Switzerland ..	542	951	1473	13. Netherlands	49	234	283
2. United States ..	382	235	617	14. Canada	129	123	252
3. Austria	239	302	541	15. Italy	152	45	197
4. Germany	186	305	491	16. Czechoslovakia ..	53	109	161
5. France	264	225	489	17. Hungary	91	69	160
6. Belgium	283	184	467	18. Finland	51	40	91
7. Denmark	223	238	461	19. Estonia	54	9	63
8. Sweden	115	301	416	20. Japan	58	3	61
9. Great Britain ..	191	216	407	21. U.S.S.R.	38	1	39
10. New Zealand ..	149	258	407	22. Poland	17	5	22
11. Norway	173	230	403	23. Yugoslavia	8	9	17
12. Australia	192	148	340	24. Bulgaria	7	7	14

On the whole Table 9 agrees fairly well with our previous tables, provided we make allowances for a few main facts. One is that Belgium, France and probably Austria are rated too high and Great Britain too low, for reasons already explained. Another is that the inventiveness of the four new English-speaking countries may be underrated from the standpoint of patents abroad because of their remoteness, and because three of them have only lately become industrial. The United States is certainly underrated because its inventors have so vast a home market that they are not much interested in taking out patents across the sea. Another important point is that the home patents granted in the Netherlands obviously underrate that country's inventiveness. The Dutch, it would seem, must be as inventive as

⁶ The figures for foreign patents have been adjusted to allow for the fact that outside a large country, such as the United States, the industrial population among which it is worth while to take out a foreign patent is necessarily smaller than outside a small country.

the Belgians. They take out more patents abroad—234 per million inhabitants against 184. The probable fact is that because Holland is primarily a commercial country, the Dutch have not paid much attention to mechanical inventions. And finally, the low figures for the countries from Italy downward may be due largely to lack of opportunity and incentive for invention rather than to lack of ability.

In spite of these limitations it is certainly significant that in taking out patents both at home and abroad (Column C in Table 9) Switzerland far outranks every other country, and the United States comes second. Austria's position in third place is doubtful. Nevertheless, the fact that it is followed by Germany suggests that these Germanic countries are somewhat like Switzerland in inventiveness, although far behind. The next group of countries (Nos. 5 to 14 with totals of 489 to 252 in Column C) comprises North Sea countries, including all of Scandinavia, but also embraces the British dominions of Australia, New Zealand and Canada. Lower down, as usual, we find eastern and southern Europe, with the Soviet Republic and Japan near the bottom. Although Great Britain does not make a very brave show in Column C, it is possible that in real inventiveness it may rival Germany, for the number of home patents is about the same in both countries. The three British dominions take out only half as many home patents as the United States in proportion to the population. All four countries are so much alike, however, that the inventive capacity of the dominions probably rivals that of the United States.

Switzerland's inventiveness is especially interesting. In previous comparisons Switzerland has proved to be only medium in agricultural productivity per person (Table 1), as is natural in a country with such limited resources, but it excels in other respects. In health (Table 3) it slightly outranks the United States; it surpasses all except the four new English-speaking countries in diet (Table 6); it is outranked only by New Zealand and the United States in medical care (Table 7); and only by those two countries and Great Britain in income per capita (Table 8). In other respects not here discussed it also rises well above the adjacent countries. This superiority is doubtless due to a variety of causes, but one important factor may be mentioned. Switzerland, far more than any other country in Europe, has been a refuge for those who were oppressed because of religious or political opinions. Such people usually think for themselves and are adaptable. This means that they are likely to be thoughtful and inventive. Although direct proof is lacking, Switzerland's high position may owe a good deal to an unconscious selective process whereby immigrants of unusually high quality have been seeping into the country for centuries. This human quality has been reinforced by several other factors. Switzer-

land has one of the best climates in Europe. Its mountains have helped to prevent it from being swamped politically by outside influences. The poverty of the natural environment has meant that if the energetic and clever Swiss were to maintain a high standard of living, they must use their wits. They certainly have done so, with results which in many respects put them ahead of any other European nation.

Conditions in the United States parallel those in Switzerland in certain respects. Some states, such as Connecticut with 920 home patents per million inhabitants, California with 760, and New Jersey with 740, stand higher than Switzerland (548) in inventiveness. In Connecticut the reasons for this appear to be much the same as in Switzerland. The population contains a large number of descendants of people who migrated because of religious and political convictions, or because of unusual energy and ambition. They settled in a region with an unusually healthful and stimulating climate, but with a rugged topography unfavorable to agriculture and with few natural resources. Their home is within easy access of other progressive regions. There they developed the manufacture of small metal goods, a type which especially lends itself to new inventions.

New Jersey and California are much like Connecticut so far as the caliber of their settlers and the stimulating quality of their climates are concerned. New Jersey is like Connecticut in its location with reference to other active parts of the world, and in the way in which its types of manufacturing stimulate invention. Both California and New Jersey, however, are far richer agriculturally than either Connecticut or Switzerland. Moreover, California is remote from other centers of activity; it has not been conspicuous in manufacturing, and until recently its main types of manufacturing, such as fruit canning and oil refining, have not been the kind to promote invention so much as do types like hardware. One factor in California's high rank may possibly be the extremely high proportion of adults in comparison with children. More importance, however, should perhaps be attached to selective migration, whereby an unusual number of intelligent people have moved to the west coast.

The factors which seem to be most persistently present in regions that show the highest inventiveness are a population in which selection through migration has been especially effective, a stimulating climate, and a well-developed industrial life. These are reinforced by a good diet, and effective medical service. The results are evident not only in inventiveness, but in high productivity and income. The exercise of this inventive faculty declines in the southern United States where the number of patents falls to 150 or even 100 per million inhabitants, and also in eastern and southern

Europe where still lower figures are found. This agrees with the preceding conclusions. Inventiveness seems to be especially sensitive to unfavorable conditions of physical vigor no matter whether these are due to climate, diet, poor medical care, poverty, or other causes.

H. *Summary and Conclusion*

As a summary of this paper let us compare the position of the United States with that of Japan and the U.S.S.R. The various factors for which tables are here given may well be arranged in the order of the distance of the United States from the top. Health is our weakest point, for in Table 3 we stand seventh with an index of 92.5 for the white population. If we would equal New Zealand in this respect we must pass Switzerland, Sweden, Norway, Austria, and the Netherlands. Japan and Russia stand far down on the list with an index of about 70 which is essentially the same as that of Hungary and Poland. If data for all countries, instead of for only 30, were available this position would by no means seem so low. It puts these countries about half way between the Netherlands or Australia and India.

In agricultural productivity (Table 1) as well as in health the United States must do great things if it would equal New Zealand. Our productivity per man is only one-fourth that of New Zealand and far below that of Australia, Argentina and Uruguay. It should be noted, however, that in all of these most productive countries cattle or sheep are a main source of income. Among our farmers on the other hand, only a small fraction depend mainly on cattle, and many of these are dairymen. They cannot produce so great a value per man as can raisers of beef cattle or sheep who have vast areas of land at their disposal. Both Japan and Russia, on the other hand, stand close to the lower limit in agricultural productivity per man. In Japan this is obviously due in large measure to overpopulation and to the fact that the uncultivated five-sixths of the land are unfit for cattle or sheep because of the coarse, harsh vegetation. Russia, too, as we have seen, is really overpopulated. Its high proportion of peasants, its short and relatively unproductive growing season, and the difficulty of keeping farm animals during the many months of severe frost are great handicaps.

Turning next to diet (Table 6) we find that Australia appears to be as well fed as we are, while Canada and New Zealand surpass us. Japan and Russia unfortunately stand close to the opposite extreme, as might be expected from their agricultural handicaps. Judged by medical care (Table 7) we are better off than in diet, for only New Zealand appears to surpass us. In this respect Japan and the U.S.S.R. part company. Japan to be sure, gets a rating of only 40 compared with 94 for the United States, but

that is much better than the 20 of the Soviet Republic. In fact it is remarkably good when compared with 50 for the Netherlands, or 59 for England. It shows what can be done by a determined people, even if they are poor.

In two respects we appear to stand second. Taking the United States as a whole we are surpassed by Canada in industrial productivity per man (Table 2) and by Switzerland in patents (Table 9). In the first of these respects Japan does only about a third as well as this country. This, however, represents a truly remarkable feat for so poor a country, for it puts Japan practically on a par with Norway, Sweden, Belgium and France. Russia probably stands lower, but no data are available. It is clear, however, that differences in industrial productivity per man from country to country are much less than in agricultural productivity. The recent remarkable industrial progress of both Russia and Japan does not yet seem to have resulted in any great outburst of inventiveness, but our figures for patents are old (1925) and represent only a single year so that they may be misleading. This leaves income per capita as the only one of the criteria here employed in which the United States is at the top. Canada, however, is close at our heels and New Zealand is fast catching up. Nevertheless, if we take the northern and western United States alone, no other part of the world is so well off. Here again Russia and Japan stand close together, but at a level only about one-fifth or one-sixth that of the United States.

In assessing the value of the tables given in this article, it must be remembered that many of the basic data are still far from exact. Nevertheless, the general results put the various countries in approximately their correct position in comparison with one another. The tables are bound to be modified when a new set of statistics becomes available after World War II. For the present, however, and probably for some years to come, most of the tables represent the best that is yet available. They afford material for many important geographical comparisons. It is most fortunate for geography that the League of Nations has done such good work in collecting statistics and that men such as Colin Clark and M. K. Bennett are making such good use of them.

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The Unincorporated Hamlet

One Element of the American Settlement Fabric¹

GLENN T. TREWARTHA

In its broader pattern the fabric of American settlement consists of the following elements: (1) scattered, isolated, one-family farmsteads and, (2) similarly dispersed but many fewer non-farm rural residences; together with, (3) a series of agglomerated urban units, which in ascending order of centripetal power are: hamlet, village, town, and city.

The farmstead, the most universal of these elements, in so far as regional differences are concerned, appears to be almost totally without a literature. Open-country non-farm settlement not only lacks a literature, but its very existence is frequently ignored by writers on rural life. Yet several thousand miles of traverse throughout southwestern Wisconsin convinces me that non-farm homes outside of agglomerations probably are a more important unit of American rural settlement than is commonly recognized.

Of the nucleated elements, the unincorporated hamlet represents the first hint of thickening in the settlement plasm. It is neither purely rural nor purely urban, but neuter in gender, a sexless creation midway between the more determinate town and country. Probably it is in part because of its amorphous character that it has received so little direct attention from students of settlements, and this in spite of its ubiquitous character. The few, and usually oblique, contributions that have been made are almost exclusively by rural sociologists.

The present study of hamlets is confined to twelve counties included within the rough, unglaciated lands of southwestern Wisconsin—a portion of that region which, in previously published papers, I have designated as the *Driftless Cuestaform Hill Land*.² This study of hamlets is, therefore, an additional phase of the total geography of a region, the investigation of which has been continued over a number of years. It is more than that, however, for the present paper purports to describe techniques and methods of hamlet investigation, which at a subsequent time may be applied to larger areas, or even to the entire United States. For the latter purpose the region chosen for this study may be thought of as a convenient laboratory wherein techniques and methodologies for studying hamlets have been developed and tested.

¹ This work was supported in part by a grant from the Special Research Fund of the University of Wisconsin.

Sources for Data on Hamlets, and Methods of Study

Published source materials on hamlets are discouragingly meager. United States census data completely ignore unincorporated places, most of which are hamlets, and include them with the general rural population. As a result one is obliged to have recourse to such sources as Dun and Bradstreet's reference books, and to comprehensive atlases published by such companies as Rand McNally and George F. Cram. But partly because these sources have no precise definition as to the minimum requirements for inclusion among nucleated settlements, their rosters of unincorporated hamlets have numerous sins both of omission and commission. Large numbers of places are listed with no populations given. It is understandable why a settlement type that is so much in the twilight zone between urban and rural, and usually has such indeterminate boundaries, would be a difficult one on which to get an accurate count of numbers and the facts concerning their distribution, let alone correct population figures. Personal inspection of these small places by representatives of the atlas companies is not customary and they are compelled to rely for population data upon the estimates of local residents. Some hamlets are omitted which, from field inspection, obviously should be included, while many place names are listed for which there are no genuine settlements.

Other sources of information concerning contemporary hamlets are, (1) airplane photographs of a scale 4 inches = 1 mile or larger, (2) maps prepared by the State-wide Highway Planning Survey, and (3) for Wisconsin, the maps of the Land Economic Inventory Division. In preparation for the field work all of the above sources were employed in one way or another.

Airplane photographs are at present available for large parts of the country. A complete set covering the entire state of Wisconsin was made available to me in the office of the State Highway Department in Madison.

² Six papers have been published on this region:

1. Glenn T. Trewartha: The Prairie du Chien Terrace: Geography of a Confluence Site, *Ann. Assoc. Amer. Geogrs.*, XXII (1932), pp. 119-158.
2. ———: French Settlement in the Driftless Hill Land, *Ann. Assoc. Amer. Geogrs.*, XXVIII (1938), pp. 179-200.
3. ———: The Earliest Map of Galena, Illinois, *Wis. Magazine of Hist.*, XXIII (1939), pp. 40-43.
4. ———: A Second Epoch of Destructive Occupance in the Driftless Hill Land, *Ann. Assoc. Amer. Geogrs.*, XXX (1940), pp. 109-142.
5. ———: The Vegetal Cover of the Driftless Cuestaform Hill Land: Pre-settlement Record and Post-glacial Evolution, *Trans. of the Wis. Acad. of Sci., Arts, and Letters*, XXXII (1940), pp. 361-382.
6. ——— and Guy-Harold Smith: Surface Configuration of the Driftless Cuestaform Hill Land, *Ann. Assoc. Amer. Geogrs.*, XXXI (1941), pp. 25-45.

These photographs were particularly valuable in checking the ground plans of hamlets. A count of buildings was not possible because of the obscuring effects of trees. The source was of no value in analyzing the functional uses of buildings.

The Highway Planning Survey maps for the entire country, published by county units, have been constructed from road inventories conducted within the last few years by the various State Highway Departments. The maps themselves have been prepared by these same highway departments in cooperation with, and under the general direction of, the United States Bureau of Public Roads. By reason of the general supervision of the work exercised by the federal bureau, the maps are standardized in terms of method of field procedure, scale, format, and content. Although the county maps are published at the scale 1 inch = 1 mile (some states employ a scale 1 inch = 2 miles), due to the congestion of culture in unincorporated places many of the latter settlements are shown in greater detail on inset maps, scale nearly 8 inches = 1 mile. For the country as a whole this set of maps comprises the single most comprehensive and valuable source for the study of the ground plans and functions of unincorporated settlements. Among the more common culture forms distinguished are: residences both farm and non-farm, halls, mills, business establishments, hotels, churches, schools, and factories, and others that are less common. Unfortunately *types* of businesses and *types* of factories are not differentiated. From my study of hamlets in the field I was forced to the conclusion that there were appreciable differences in the mapping accuracy of various field parties. In some cases even the road and street patterns were inaccurate, although more often it was in the number, functions, and spacings of buildings that errors occurred. Considering however that the mapping was done by untrained men, working from moving cars, and recording their data on blank sheets of paper (not plats) with only speedometer readings to indicate locations, the results certainly are not bad. Exact location was not one of the goals sought.

The Land Economic Inventory maps are more limited in their usefulness since they are restricted to Wisconsin, and maps for only a part of the state have been published. For those counties the maps of which have not been published, manuscript maps, scale 4 inches = 1 mile, are available. Most of the maps are published in township units, scale 1 inch = 1 mile. Unincorporated places are not enlarged. Culture is represented in somewhat greater detail than on the highway maps, and kinds of businesses, mills, and factories are indicated. All the later maps published have been checked against airplane photographs.

The procedure followed in making use of the previously described sources of published data preparatory to going into the field was something as fol-

lows. Complete lists of all places with populations given as 150 or under, and places listed by name but without populations given, were compiled from Dun and Bradstreet's 1940 reference book and from Rand McNally's and Cram's atlases. All such places listed by any one of these sources were accurately located on a large highway map of the state so that economical routes could be laid out for inspecting each hamlet in the field. Using the *original* field maps prepared by the Land Economic Inventory workers, scale 4 inches = 1 mile, a preliminary sketch of the ground plan of each hamlet was traced. Many of these were checked against air photos and it was found after getting into the field that time would have been saved if all had been so checked and corrected. On the highway or street plan thus sketched, and using the same source, buildings were located and their functional uses noted. A comparison was made with the similar data provided on the Highway Planning Survey maps and the discrepancies between the two sources noted. Although the hamlet sketches thus prepared were of genuine value in the field as far as the road and street patterns were concerned, the wisdom of plotting the buildings is open to question. Erasures and corrections often took more time in the field than a first and original location of the buildings and their functions from field observation would have done. On the other hand, the sketches were useful in checking my field observations.

Mapping the hamlets of the twelve counties in the field during the summer of 1940 involved an expenditure of about three weeks time and a car traverse of roughly 2,000 miles. The number and arrangement of the buildings within a hamlet and their functions are intended to be rigidly accurate; their spacing is only approximately so. For the most part the buildings were not located by pacing, but by spacing them by eye within limits set by certain landmarks and within distances measured by the car's speedometer. Mapping was done both from the car and on foot, but largely the former. No driver was employed. Interviewing was resorted to only where there was some doubt about functional uses of buildings. Mapping was on a scale of 4 inches = 1 mile.

What Is a Hamlet?

The question may well be raised as to what constitutes a hamlet. Does it have certain minimum and maximum requirements or limits that separate it, on the one hand, from the open-country farmstead and, on the other, from the more pretentious village? The Institute of Social and Religious Research places the division line between hamlet and village at the population figure 250.³ No reasons are given for adopting this particular upper limit and no minimal figure is suggested. Landis⁴ likewise has defined hamlets

³ Luther Fry: *American Villagers*. George H. Doran Co., New York, 1926.

as settlements having fewer than 250 inhabitants, but no explanation is offered as to why this arbitrary figure was adopted. A lower limit for hamlet population was not suggested. Brunner and Kolb⁵ make the statement, "According to technical definition, hamlets are places of less than 250 population," but there is no indication as to the origin of the definition. A minimal limit appears to be ignored by all of these authors.

Other writers have described hamlets rather loosely in terms of their functions, but have not attempted to assign to them population limits. In general the unincorporated place, lacking as it does census recognition, is taken as being somewhat synonymous with hamlet. Such sources as Dun and Bradstreet's Reference Book of Commercial Ratings and Rand McNally's and Cram's atlases, have no consistent rules relative to minimal requirements of settlements that are to be included. Thus Dun and Bradstreet includes all places that have one or more mercantile establishments whether or not they have resident populations. Emphasis is upon the location of a business rather than upon the validity of a place as a bona fide settlement. Thus a single general store at a crossroads, if the location has a place name, may be listed even though no population figure is given. On the other hand, it is not unusual for a business enterprise in a hamlet with no postoffice to be listed by Dun and Bradstreet under the name of an adjacent settlement from which it receives mail by rural free delivery. Consistency is not conspicuous. Small population groups clustered about a church, school, or townhall nucleus, and without a business establishment, are not included. Prior to July, 1918, the Reference Books also included post offices where no business establishment existed. This practice was discontinued after 1918. Rand McNally admits of having no established rules for determining what unincorporated places shall be included in their atlas lists. According to a personal communication from one of their staff, they "... try to include all places in existence that have a name." Population size has nothing to do with the decision, although they consider it important as descriptive data. Ignorance was professed as to what selective procedures had been employed in the past for determining the place names to be included. Cram has much the same type of loose rules for compiling its roster of unincorporated settlements.⁶

⁴ Paul H. Landis: The Number of Unincorporated Places in the United States and Their Estimated Populations, *Research Studies of the State College of Washington*, Vol. VI, No. 4, Pullman, December, 1938. See also by the same author: The Growth and Decline of South Dakota Trade Centers, 1901-1933, *South Dakota Agric. Ex. Sta. Bull.*, 279, Brookings, 1933; Washington Farm Trade Centers, 1900-1935, *Washington State Agric. Ex. Sta. Bull.*, 360, Pullman, 1938.

⁵ Edmund de S. Brunner and J. H. Kolb: *Rural Social Trends*. Published under the direction of the President's Research Committee on Social Trends, New York, 1933, p. 83.

In my opinion neither Dun and Bradstreet, Rand McNally, nor Cram provide an accurate source for determining the number of hamlets or their functions, for those relatively inconspicuous settlements are neither crossroads stores nor railroad junctions, nor are they local names applied to neighborhood areas whose centers are a church, school, or town hall. As a result of analysis in the field of scores of hamlets, I have arrived at a working definition or description of them. (Unfortunately it is a definition that makes published sources less useful and field observation more necessary. It is possible that the combination of Dun and Bradstreet's Reference Books or Rand McNally's and Cram's atlases, supplemented by the county highway maps prepared by the Statewide Highway Planning Survey, would permit a nationwide study of hamlets involving their numbers, distribution, ground plans, and functions.) Primarily hamlets are agglomerations of people together with their residence and work units. This clustering effect should be sufficiently marked so that the field worker is conscious of a perceptible node in the fabric of rural settlement. It should be so real as to be unmistakably conspicuous in the field. Defined quantitatively I propose that there must be a minimum of, (1) *four* active residence units, at least two of which are non-farm houses; (2) a total of at least *six* active functional units,—residential, business, social or otherwise; and (3) a total of at least *five* buildings actively used by human beings.⁷ According to the above minimal requirements four farmsteads each located at one corner of a crossroads could not comprise a hamlet even though, as far as residence units are concerned, four are all that is required. Counting four or five people to a residence this minimum of four residence units in a hamlet establishes a minimum population of 16 or 20. Spacing of buildings in a hamlet must be such as to give an appearance of compactness exceeding that of ordinary farmstead spacing. In a hamlet composed of the minimum number of buildings, the maximum linear distance between the outermost buildings should not exceed one-quarter mile.

For a number of reasons a population of approximately 150 (not more than 38 residences) was adopted as the maximum for hamlets, and therefore the limit separating them from villages. When settlements reach about that

⁶ In a personal letter from E. A. Peterson, General Manager of the Cram Company, he states: "So far as the index is concerned we are supposed to show all name places, including . . . railroad junctions which frequently consist of no population at all. . . . In fact, the index is supposed to be unabridged. That is, we try to take in everything. . . ."

" . . . Our unabridged index is supposed to be made up so that you can locate any place that you look for. This makes it necessary for us to include all names which a town may go by."

⁷ In hamlets a building often houses more than one functional unit.

size it was found that there existed a distinct tendency for them to incorporate. Apparently they become conscious of their contrast with the countryside in general and, as a community, desire more services than the county or township in which they are located is willing to provide. It was found also that in communities with over 150 inhabitants there was a marked tendency for a distinct business core to develop, a feature that is not conspicuous in most hamlets. The population figure of 150 likewise seems to separate settlements where doctors, dentists, lawyers, and other professional men are nearly completely absent, from those larger ones where they are more common. Teachers and preachers are not so uncommon even in hamlets.

The Origin and Development of Hamlets

The twelve counties in southwestern Wisconsin included in the present study probably had no white population as late as 1820. A decade later miners from the Galena center in Jo Daviess County, Illinois, had spread northward into those counties south of the Wisconsin River.⁸ The old French-Canadian town of Prairie du Chien just north of the mouth of the Wisconsin River contained practically all of the white settlers north of that river in western Wisconsin. For two more decades, or down to 1850, the population in western Wisconsin was surprisingly concentrated south of the Wisconsin River, and it was not until the decade 1850 to 1860 that there was a marked surge northward with the result that the frontier was carried well northward in the Driftless Hill Land.⁹

Hamlet founding in southwestern Wisconsin appears to have been relatively contemporaneous with the settlement of the region. The records are too fragmentary and unreliable to be able to make a precise count of the hamlets in terms of their dates of founding. In Grant County, situated south of the Wisconsin River, and because of its lead resources one of the earliest settled, at least eight of the present 27 hamlets were in existence before 1860 and 22 had developed before 1877. Of Richland County's 27 modern hamlets at least 17 (probably more) had been founded by 1874. These were the trade, political, religious, and social centers for the farmers and miners who lived in open-country fashion in the tributary areas. It is not strange therefore that these tiny crossroads service centers should have sprung into being following closely upon the passage of the frontier.¹⁰

⁸ Trewartha: A Second Epoch of Destructive Occupance, *op. cit.*, pp. 133-135. See also Mary Jo Read: A Population Study of the Driftless Hill Land During the Pioneer Period, 1832-1860, Ph.D. Dissertation, University of Wisconsin, 1941, Fig. 1, p. 2.

⁹ Read: *Ibid.*, Fig. 34, p. 76; Fig. 51, p. 130, and Fig. 82, p. 202.

¹⁰ The frontier has been defined as regions having fewer than 2 persons per square mile.

For most of the present-day hamlets the precise reason for their founding cannot be discovered. From county histories and from historical atlases of the several counties I have been able to piece together only a fragmentary pattern of hamlet beginnings. The sources of information, (1) are of variable reliability for the different counties, (2) exist for different dates for the different counties, and (3) such as local atlases and histories appear to be lacking entirely for some counties. The end result is that anything like a comprehensive and complete analysis of hamlet origin for this region is out of the question. By piecing together fragments of information from various sources however certain type origins begin to emerge.

Even from the unsatisfactory records available, it soon becomes apparent that a relatively large number of hamlets in southwestern Wisconsin did not originate immediately out of the needs of the surrounding countryside, but rather were conceived, laid out, and platted by promoters who hoped thereby to profit from the sale of lots in the new settlement. There are numerous instances of such promotion settlements that "died a borning" and never developed beyond the plat stage. But on the other hand, there were enough others that were well conceived and properly located so that they became bona fide hamlets or villages. Using Grant and Richland as examples—two counties containing a large number of modern hamlets and for which there are relatively good historical data—14 of the 27 present-day hamlets in Grant began as platted settlements and 12 of the 28 in Richland. Vestigial traces of these early platting are to be seen in a number of modern hamlets, what were supposed to have been streets now appearing as grassy lanes utilized as public pasture or even garden land. Occasional houses fronting upon these lanes aid in disguising the hamlets' indefinite margins. It is impossible, from the available records, to determine in how many of the platted settlements some sort of occupance unit, such as a mill, church, school, or general store may have existed on the site before platting occurred.

A fairly common center of accretion, having sufficient centripetal power to induce minor coagulation within the open-country settlement plasm, was the fourth-class post office. One of the first requirements in a frontier region of new settlement was some center from which mail could be sent and received. Frontier post offices were established in farm homes, and occasionally in cross-road general stores, blacksmith shops, or similar establishments. From over a wide neighborhood farmers and miners were drawn frequently to a post office center and as a consequence business and service units were attracted to these focal points forming the nuclei of settlement. From the early atlases and histories of Grant and Richland counties I have been able to determine that of the 27 modern hamlets in Grant, 21 at some time in the past had post offices. Twenty of the 28 (four not mentioned)

hamlets in Richland were also early post office sites. In fact, of all the functions represented in hamlets prior to 1900, postal service was the most universal and appears to have been one of the most common reasons for the origin and growth of small cross-roads settlements.

Other business and service units most commonly represented in the beginnings of hamlet life were: mills, both saw and flour (13 out of the 27 hamlets in Richland and 11 out of the 27 in Grant); general stores (13 in Richland, 17 in Grant); Churches (11 in Richland, 17 in Grant); and schools (11 in Richland and 17 in Grant).

ARE HAMLETS DECLINING IN NUMBERS AND POPULATION?

Evidence from Earlier Studies

In the previous studies that have been made of the relative numbers of unincorporated places in different decades, it should be borne in mind that all counts of hamlets have been from sources whose lists were not prepared with such a use in mind. No attempt was made by the writers to winnow from these all-inclusive lists, containing as they do many listings which are merely place names or sites of a business enterprise only, and without settlement characteristics, the genuine bona fide hamlets. In all of these sources large numbers of tiny hamlet settlements are listed but without populations given so that checking for size is impossible. The work of these writers is consequently a count of place names rather than of genuine unincorporated settlements. For example, in the 12 Wisconsin counties studied there were in 1940, as determined by field observation, 167 bona fide hamlets with populations of 20 to 150. Employing the same standards, Dun and Bradstreet listed only 86 such unincorporated places within the same area, although there were 147 named, 61 of which either had no population figures given, or the figures were below 20. Rand McNally's comparable figures for the 12 counties (1938 atlas) were 140 with a population between 20 and 150 and 224 in total (Table 1). If one thing is clear it is that there are wide discrepancies between the three sources. If one takes the bona fide hamlets in these 12 counties today, whose genuineness has been proven by field observation, he finds that they are the same ones concerning which there is no doubt of their reality 25, 50, or even 75 years ago. It is the marginal ones of dubious existence that flit in and out of the records over the years, causing remarkable fluctuations of the counts at different periods. One may well doubt whether many of these ever attained the stature of real hamlets and whether the widely variable counts of them indicate anything but changing policies regarding neighborhood place-name inclusions.

The most direct and comprehensive attack upon the problem of growth or decline of unincorporated hamlets are the studies by Paul H. Landis.¹¹

TABLE 1

*Counts of the Numbers of Unincorporated Hamlets in 12 Counties of Southwestern Wisconsin (about 1938 to 1940) from Three Different Sources**

County	Field count	Rand McNally		Dun and Bradstreet	
		Selected	Unselected	Selected	Unselected
Green	7	7	11	4	7
Sauk	9	8	12	2	9
Vernon	20	16	23	13	18
Richland	27	17	28	15	24
Crawford	13	11	18	3	19
Dane	17	13	19	9	13
Grant	27	20	29	15	18
Iowa	6	6	17	4	6
Juneau	6	6	13	1	6
La Crosse	12	11	17	7	10
La Fayette	12	11	16	5	8
Monroe	11	14	21	8	9
Total	167	140	224	86	147

* The terms "selected" and "unselected" as used in this study and applied to hamlet counts have the following meaning. The selected column includes only those settlements with populations given as between 20 and 150 inclusive. Unselected includes, in addition to all of those places in the selected column, others with populations given as below 20, and still others merely listed by name and for which no population figures are given.

Using the Bradstreet Book of Commercial Ratings as his source of data, Landis concludes that, in the United States, for the three decades, 1900 to 1930, hamlets (places with fewer than 250 people) declined in numbers, and except for the decade 1900 to 1910, likewise in population. Since for many of the unincorporated places listed in Bradstreet no population figures are given, it is difficult to see how Landis arrived at total populations of hamlets for each of the three decades. Moreover, my experience with Dun and Bradstreet as a source for hamlet counts leads me to think that omissions are numerous. For example the Dun and Bradstreet book for 1940 omitted the names of five bona fide hamlets with business places in Vernon County, Wisconsin, and there were two additional neighborhoods with fewer than 20 people having business units that were likewise omitted. In Richland county five were missed, and in Grant also five. Landis attributes the apparent decline in hamlets as shown by Dun-Bradstreet data to, (1) the rapid expansion of surfaced highways after 1910 associated with the increased use

¹¹ Paul H. Landis: The Growth and Decline of South Dakota Trade Centers, 1901-1933, *South Dakota State Agric. Exper. Sta. Bull.* 279, Brookings, 1933. Washington Farm Trade Centers, 1900-1935, *Washington State Agric. Exper. Sta. Bull.* 360, Pullman, 1938. The Number of Unincorporated Places in the United States and Their Estimated Population, *Research Studies of the State College of Washington*, Vol. VI, No. 4, Pullman, 1938.

of automobiles, and (2) the rapid decline of the fourth-class post office. Landis admits that the extreme fluctuations in the number of hamlets over a period of decades in part is probably the result of errors in the source materials rather than in historical fact. The only field check made of the data was in four Massachusetts counties where it was demonstrated that this was actually the case. His personal acquaintance with conditions on the Great Plains and in the Far West, in Landis' opinion, confirmed his conclusion that unincorporated places are declining.

Using the same source, a study of hamlets (places with a population of less than 250, and including places for which no population figures were given) by Landis, confined in this instance to the state of Washington, seemed to indicate that the number of unincorporated places rose rapidly from 1900 to 1910 and then declined with equal rapidity so that by 1930 there were fewer than in 1900. In contrast he found that the total population of Washington's unincorporated places declined from 1900 to 1920, only to rise again in the following decade and reach a figure in 1930 greater than it was in 1910. In other words the trends in numbers and in populations of hamlets were relatively opposite. Based upon business units, this same study of Washington State found that the number of hamlets with one business unit increased from 1900 to 1920, and subsequently declined. Those with 2 to 4 business units increased to 1930 and then declined, while hamlets with 5 to 9 business units increased to 1930 followed by a very slight decline to 1935.

This same writer in his study of South Dakota trade centers, 1901 to 1930, finds that the smallest settlements (under 50 inhabitants) reached a peak in numbers in about 1911. After that date they declined and by 1931 were only about as numerous as they were in 1901. Those with populations between 50 and 249 increased in number throughout the period under study, although after 1916 there was little change in numbers. The general conclusion reached by this study is that small unincorporated places have not maintained their relative importance among the nucleated settlements of the country.

C. J. Galpin in an address, "Is the Purchasing Power of the Farmers' Town Declining," Washington, D. C., May 20, 1930, stated: ". . . It is at once admitted that the general trend of the farmer in the United States is to shift his buying from cross-road country stores, hamlets with two or three general stores, small villages having no speciality stores, to larger retail trading centers. . . . It will take a long time for the country store and the neighborhood hamlet stores actually to disappear in trade, but the influence of these miscellaneous trading posts may well be discounted even at present."¹²

Herbert Hoover's committee reporting on recent economic changes in the United States, pointed out that a survey of the Southeast by the United States Department of Agriculture in 1920 found that a shift in trade from country districts to larger trading centers was common in all sections of that part of the country.

From a study made of retail trade centers in southeastern Nebraska it was concluded that good roads and automobiles have the effect of attracting trade away from the smaller communities.¹³ Several stores in these small places had not declined in numbers but their trade had been affected. The opinion was expressed that this trend did not spell the doom of the country merchant but might require a readjustment of functions. It was noted however that the cross-road store still possesses the advantage of being closer to its customers and of having less expenses than its more urban competitors.

The conclusion reached from a study of the effects of the automobile upon village merchants in 45 villages in Illinois was that the sales of the dealers in small villages (under 400 population) had declined more than the sales of dealers in larger villages.¹⁴ This is only suggestive of what might have occurred in communities of hamlet size for such places are not specifically mentioned.

T. Lynn Smith in his study of farm trade centers in Louisiana¹⁵ finds that the very small trade centers (with 1 to 5 business units) in that state increased in numbers from 1901 to 1916. Subsequently they declined rapidly so that in 1931 there were fewer than in 1901. Most of the decline was in sections immediately surrounding great metropolitan centers and in the back country. The better the road facilities the more able were the small business centers to maintain themselves.

Lively,¹⁶ in a study of trade centers in Minnesota (using Dun and Bradstreet as his source), found that the number of unincorporated trade centers declined between 1905 and 1929 except in areas undergoing settlement.

Carle C. Zimmerman,¹⁷ while not specifically mentioning unincorporated

¹² Quoted by Landis, *Bull.* 279, *South Dakota Agric. Ex. Sta.; op. cit.*, p. 10.

¹³ The Influence of Automobiles and Good Roads in Retail Trade Centers. *Univ. of Nebr. Studies in Business*, No. 18, Lincoln, 1927.

¹⁴ The Automobile and the Village Merchant. *Bull.* 19, *Bur. of Business Research, Univ. of Ill.*, 1928.

¹⁵ T. Lynn Smith: Farm Trade Centers in Louisiana, 1901 to 1931, *Bull.* 234, *Louisiana State Univ. Agric. Exper. Sta.* 1933.

¹⁶ C. E. Lively: Growth and Decline of Farm Trade Centers in Minnesota, 1905-1930. *Bull.* 287, *Univ. of Minn. Agric. Exper. Sta.*, St. Paul, 1932.

¹⁷ Carle C. Zimmerman: Centralism versus Localism in the Community. *Amer. Sociological Rev.*, Vol. 3, 1938, pp. 155-166. See also by the same author, *The Changing Community*, New York, 1938.

places with fewer than 150 inhabitants, is of the opinion that small local communities and trade centers, even in this day of automobiles and good roads, are essential elements of the settlement pattern. He cites the example of the pioneer belts in the Canadian Prairie Provinces which were largely settled after modern transportation methods were in general use. There, under the Canadian method of settlement, the larger trade centers, administration offices, and central social units were set up first, so that any development of small local communities would arise in response to basic social needs rather than as an adaptation to poor communication facilities. (In the United States the origin of such communities has been attributed to poor communications at the time of settlement.) After 25 years of settlement in the Canadian Prairie Provinces it was found that the proportion of small local communities was as great as in the older settled regions. Zimmerman's conclusion is that localism probably satisfies a permanent and universal societal need.

Evidence Concerning the Rise and Decline of Hamlets in Twelve Wisconsin Counties

As a further method of testing the evidence relative to a decline in the number of hamlets during the past few decades it was decided to study the evidence available for 12 counties in the Driftless Hill Land of southwestern Wisconsin. Data on the number of hamlets in this region were collected for the period 1882-1940 from four sources: (1) Dun and Bradstreet's reference books, (2) Rand McNally's atlases, (3) Cram's atlases, and (4) field maps of the individual hamlets which I constructed from personal observation during the spring of 1940. In the three published sources I differentiated between, (1) those bona fide hamlets whose populations were given as between 20 and 150 inclusive, and (2) a considerably larger group, which in addition to those just defined, includes all others with populations below 20, and also those merely listed but with no population data given. It is this latter more inclusive, but also more dubious, count that is used by all of the writers dealing with unincorporated places. In it are included many place names designating such features as a railroad junction, a church, school, general store, mill, or cheese factory, which subsequent field observation proved were in no sense genuine settlement units.

Before analyzing the data on hamlets from the four sources it should be pointed out that the three published sources differ somewhat relative to which unincorporated places should be included. The two atlas companies, as pointed out earlier, have only the loosest kinds of rules for determining inclusions at present, and they are not aware as to what, if any, different rules have been applied by them in the past. Dun and Bradstreet's criteria

are at present more specific, but according to their own statement the rules have changed from time to time. With them emphasis is upon the location of a business enterprise rather than upon the validity of a place as a bona fide settlement.

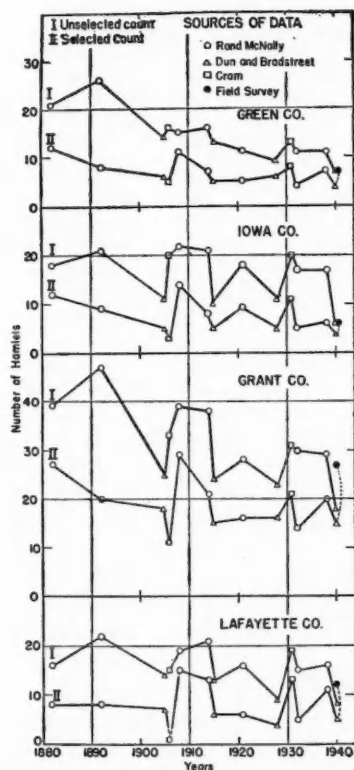


FIG. 1.—Graphic representation of what purports to be the changes in the number of unincorporated hamlets in three counties of southwestern Wisconsin over a period of nearly six decades. The 14 hamlet counts are from four different sources as indicated in the figure. Graph I for each county charts the unabridged counts and includes all places with fewer than 150 people whether a population figure was given or not. Graph II includes only those places with populations given as between 20 and 150 inclusive.

In the thirteen graphs which follow (Figs. 1 to 4), one for each of the 12 counties studied and in addition a composite graph for the combined 12 counties, the number of hamlets is plotted for 13 irregularly spaced years, beginning in 1882 and terminating in 1940.¹⁸ Seven of the counts are from

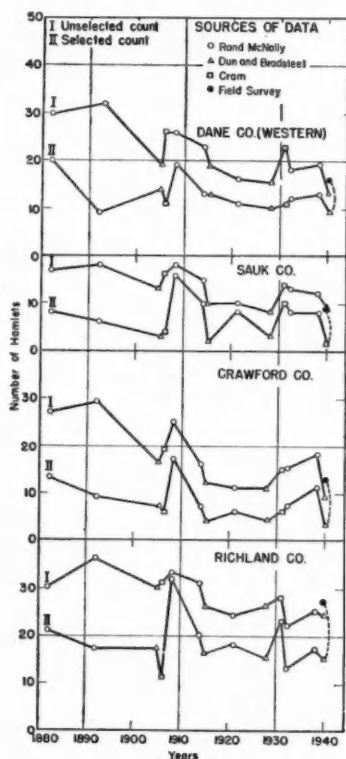


FIG. 2.—See legend for Fig. 1.

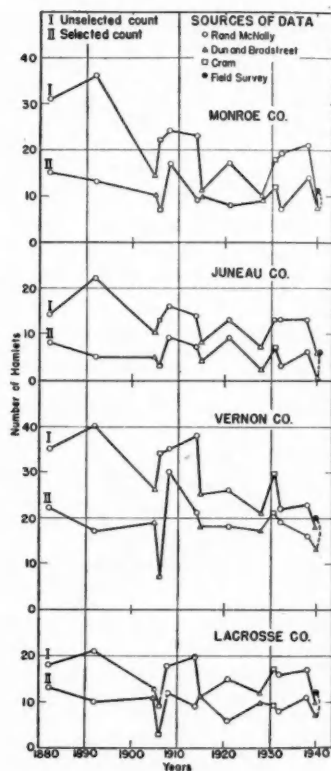


FIG. 3.—See legend for Fig. 1.

Rand McNally, four from Dun and Bradstreet, and two from Cram. In addition there is a fourteenth count made from maps of the hamlets prepared in the field during the spring of 1940. On the graphs the counts from each of the four sources have been designated by contrasting symbols so that they can be easily differentiated. In each graph-pair, the upper of the two lines, I, represents the longer and more dubious list of hamlets (unselected) described earlier in the paper (page 44), while the lower one, II, includes only those listed by any particular source as having a population between 20 and 150 inclusive (selected).

¹⁸ These counties are: Crawford, Dane (western half), Grant, Green, Iowa, Juneau, La Crosse, La Fayette, Monroe, Richland, Sauk and Vernon. The specific years for which hamlets counts were made are: 1882, 1892, 1905, 1906, 1908, 1914, 1915, 1921, 1928, 1931, 1932, 1938, and 1940.

An outstanding feature of the graph lines is their unusual irregularities. Most frequently these result from the very different totals of hamlets given by different sources in closely adjacent years. Clearly these zig-zags do not indicate violent fluctuations in the number of hamlets within the space of a few years, but rather discrepancies between the sources. Strangely the

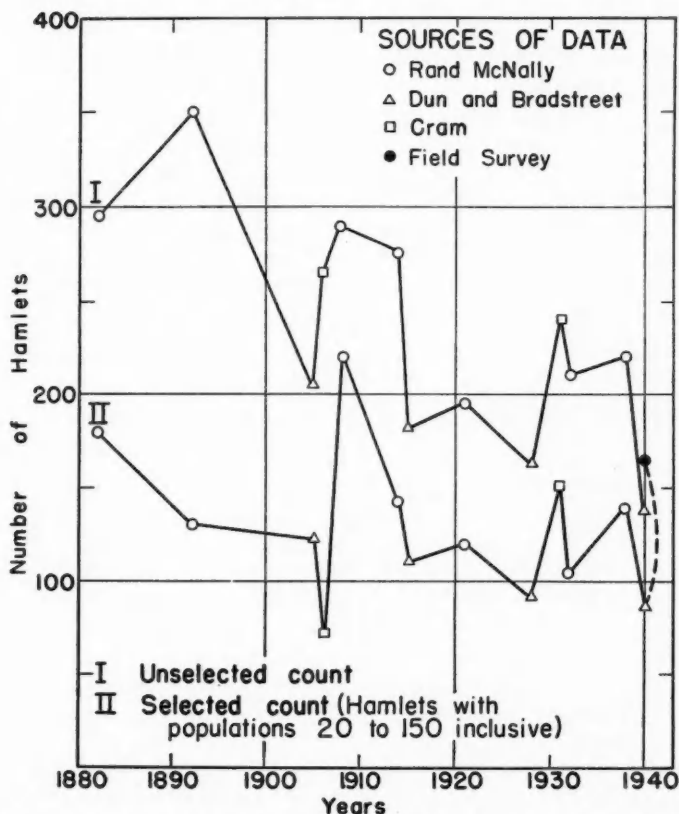


FIG. 4.—Composite graph for all 12 counties shown in Figs. 1 to 3. See legend for Fig. 1.

irregularities in the lower line (II) of each graph-pair, which is for the selected list of hamlets, are nearly, if not quite, as great as in the upper line (I), which represents the unabridged counts. With such irregularities so prominent it is difficult to reach satisfactory conclusions relative to trends in the rise and decline in number of hamlets. A further disconcerting fact is that, even when the counts of hamlets from the three published sources are rela-

tively similar, the totals usually are not comprised of the same settlements. Some that one source includes are omitted in another, and vice versa.

Depending on the various ways in which one analyzes the graphs, his conclusions relative to changes in number of hamlets during the past half century may vary. For example, using Dun and Bradstreet data exclusively, the upper graphs (I), of all 12 counties show a decline in number of hamlets from 1915 to 1940, while 10 out of 12 counties show the same trend in the lower graphs (II). This coincides with the findings of others who have employed the Dun and Bradstreet source. On the other hand, using all three published sources, in the lower graph line (II) the maximum figure from any one source for the automotive decade 1930-1940 exceeds in five counties, and equals in seven, the maximum figure from any one source for the decade 1910-1920, which largely precedes the era of trunk-line highway building and the widespread use of cars. This evidence is contradictory to that derived from Dun and Bradstreet alone. For the list of selected hamlets (lower graph) Cram shows 10 out of 12 counties to have a higher total in 1931 than in 1906, while in the other two counties the figures were equal in the two years named. For the same selected group of hamlets (lower graph) Rand McNally shows only 5 out of 12 counties with hamlets more numerous or equal in number in 1938 as compared with 1914, but eight counties with an increase or static condition between 1921 and 1938. Using the more comprehensive list of hamlets (upper graph) Rand-McNally shows a decline in the number of hamlets in all 12 counties from 1914 to 1921, but in 10 of the 12 counties there was an uptrend (6) or static condition (4) between 1921 and 1938. In other words, according to Rand McNally, hamlets appear to be increasing, at least during the last two decades. If one utilizes the data for the number of hamlets with populations between 20 and 150 inclusive (lower graph) obtained by personal field observation in 1940, the figure is higher than Rand McNally (1938) in eight of the twelve counties and equal to it in three others. It is consistently higher than the Dun and Bradstreet figures for 1940. This would seem to indicate incomplete coverage on the part of the published sources. In eight of the twelve counties the field-count of hamlets was higher than Dun and Bradstreet's inclusive count (1940) shown in the upper graph. The figure based on field observation (1940) was equal to or higher in seven counties than either the Rand McNally or the Dun and Bradstreet figures for 1914 and 1915 respectively.

Using the composite graphs (Fig. 4) showing totals for all 12 counties, the Dun and Bradstreet data show a consistent decline in number of hamlets from 1905 to 1940. If these counts could be considered reliable it indicates that the decline in number of hamlets was not coincident with the coming

into use of the automobile and the rapid expansion of surface highways, but began at least a decade and more earlier. On the other hand, using all *three* published sources, in Graph II the maximum count from any one source for the decade 1930-1940 is higher than the maximum count for any one source for the decade 1910-1920. This evidence disputes that derived from Dun and Bradstreet alone.

Using data from Rand McNally exclusively, composite Graph I (Fig. 4) shows a decline in number of hamlets from 1882 to 1921, while composite Graph II shows a decline from 1908 to 1932. Here, too, if the decline is a fact and not a matter of source unreliability, the shrinkage in number of hamlets began long before good roads and automobiles could have had any effect. In both composite graphs (I and II) the count of hamlets from Rand McNally is higher in 1938 than in either 1921 or 1931. From this the conclusion is inescapable that good roads and automobiles at the period of their maximum expansion were having exactly the opposite effect upon hamlets than that with which they are usually credited. Here too the evidence is plainly contradictory to that from Dun and Bradstreet.

The data from Cram are somewhat contradictory in composite Graphs I and II (Fig. 4). The counts of unselected hamlets show a moderate decline between 1906 and 1931, while the abridged or selected group increased markedly during the same period.

The 1940 field count of bona fide hamlets, with population between 20 and 150 inclusive, included within the 12 counties, is higher than the count of selected communities (Fig. 4, Graph II) given by any of the published sources since 1892, with the exception of Rand McNally in 1908. The field count is considerably higher than the figure for Dun and Bradstreet even within the unabridged list of hamlets, which seems to indicate incomplete coverage on the part of that source.

Summary of the Evidence Concerning the Changes in the Number of Hamlets During the Past Several Decades

Summarizing the evidence presented bearing on the question as to whether, under changed conditions of communications, the hamlet is now an obsolete settlement form and is, as a consequence, in the process of becoming extinct: the evidence presented from earlier published studies is, to my mind, inconclusive. To be sure, most of the authors lean toward the belief that small unincorporated places have been declining, and that an acceleration of the waning process has occurred during recent decades when improved highways and an almost universal use of cars has permitted farmers a wider range of trading possibilities. In none of these studies was the conclusion checked through intensive field studies. Moreover, the data

sources for these studies are, in my opinion, not thoroughly reliable sources for obtaining decade-to-decade counts of bona fide hamlets. They have been put to a use for which they were never planned or intended. A few of the studies, to be sure, expressed opinions that were either opposite to the majority conclusion or at least indicated a cautious attitude toward it. Zimmerman, in particular, was unconvinced. However, if one could rely on the hamlet counts from Dun and Bradstreet, the source used by most of the writers, one must conclude that a decline in numbers of unincorporated places has been in progress.

From my own study of hamlets in the 12 counties of southwestern Wisconsin the evidence is confusing and conflicting. Observation in the field convinces one that there are thriving hamlets as well as some that appear decadent. Fossil evidences of extinct hamlets are likewise present although they are not abundant. Decadent and even extinct hamlets should not, however, lead to the immediate conclusion that this pigmy among clustered settlements has been progressively declining and is eventually doomed to extinction. It may well be that the decline in rural population which has been true of many sections of this country, including the general region of the 12 counties in southwestern Wisconsin selected for study, has affected all settlements which depend to a greater or less degree upon the buying power of farmers. This along with the improvement and rerouting of roads, the common use of motor cars, the decline of the fourth class post-office, and the serious depression of the last decade, have all forced readjustments upon rural trading communities, and in these readjustments some hamlets may suffer and a few become extinct. From the evidence here presented for the 12 counties of southwestern Wisconsin I am unable to conclude that, within this region, the hamlet as a settlement type has suffered a progressive decline and is headed for eventual extinction.

THE DEVELOPMENT OF NEW HAMLETS

Any discussion of a change in number of hamlets quite naturally should involve the question of the generation of new ones as well as the demise of the old. Are there any forces at work today tending to create new hamlets within rural areas? I am inclined to believe that there are, although the services the new comers perform and the peoples they serve are not the same as those of the longer-established hamlets. Along the main thoroughfares, particularly at the intersections of trunk highways, there are evidences of a new type of small settlement that is catering chiefly to the transient car population, as well as to an extended local community many of whose residents are non-farmers. Among the more conspicuous services assembled at these new settlements are tourist cabins, filling stations and car repair services,

lunch counters, soft drink and confectionary booths, fruit and vegetable stands, dance halls, taverns, night clubs. The general store, so common in the older hamlets is here absent. A majority of these centers are as yet too new to have a name, so that they are not found on maps. In a great majority of the cases the assemblage of a permanent population together with their associated residences and businesses is not yet sufficiently large to warrant the name of hamlet. Yet without doubt these are centers of accretion, some of which already have reached the minimal requirements for a nucleated settlement, while others are in a prenatal stage. In varying degrees, as can be understood from the characteristic functions previously named, these newer settlements are seasonal in character, for during the winter period not only is highway traffic much reduced, but the kinds of service and products offered by these pleasure- and luxury-goods centers are

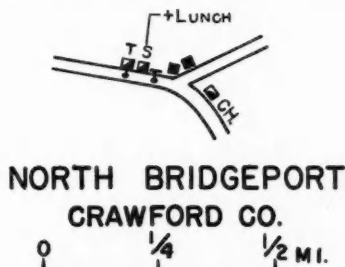


FIG. 5. See legend on p. 69.

much less in demand. How large a permanent resident population such places can attract I am not prepared to say, but I am inclined to think they will remain very small. For purposes of illustration, North Bridgeport in Crawford County, located at the intersection of highway 18 and 35 with 60 fairly well typifies these new-style hamlets (Figure 5). In North Bridgeport there are five residence units, three of them in combination with commercial units. A combined tavern and filling station, a lunch counter and embryo store, a second filling station and cheese factory comprise the business units. The one incongruous element is the cheese factory, and it is somewhat removed from the rest of the settlement and appears to outdate it as well.

SPACING AND DISTRIBUTION PATTERNS OF HAMLETS

Since a large majority of hamlets are commercial service units for a surrounding agricultural area, it is to be expected that their spacings and arrangements will reflect the farmers' needs for the services which they provide. This relationship may not be so strong in the case of hamlets as it is

with villages, for there are hamlets that have grown up around schools, churches, and town halls, and are without business functions. This probably is never the case with villages. Moreover, hamlets themselves are places of residence for a considerable number of active farm families living on farmsteads, while this ordinarily is not true of larger settlements of village and town dimensions. For settlements of the rural service-center type it has been argued that, since a majority of them originated during the era of poor roads and horse-and-buggy transportation, their present spacing indicates the convenient distance that a farmer could drive a horse to market and return within about a half day's time.¹⁹ With rural life geared to this slow mode of transportation it was inevitable that the spacing of settlements serving the farm population should be relatively close. By some it is argued that the rapid improvement of local transportation has now made these numerous, closely spaced service centers less necessary, so that some are likely to decline and even disappear while the remaining ones will grow larger, perhaps becoming villages.

According to Douglass,²⁰ the spacing of small settlements (he has reference not specifically to hamlets, but to all places of under 5000 population) depends upon three principal items: (1) the agricultural prosperity, (2) surface configuration, and (3) historical habits. According to him, small settlements are a rural luxury and they are thickest therefore where there is the greatest agricultural prosperity. Frequent trading centers are the rich farmer's convenience, or in reverse, rich farmers are the field of exploitation for numerous settlements. Surface configuration, through handicapping communications, has the effect of inducing the development of numerous small towns even though agricultural prosperity may not be so high. In support of historical habits it has been noted that the New Englander's affinity for community living resulted in more numerous village settlements where the New England element was strong. Regions settled by southerners, on the other hand, who came from a part of the country where even in the colonial period compact settlements were not the rule, are likely to have fewer villages and towns.

In the 12 counties in southwestern Wisconsin included within this study the average distance from each hamlet to the nearest hamlet is $4 \frac{1}{64}$ miles (see Table 2, Column 1). The figures for the 12 counties vary from a minimum $2 \frac{7}{16}$ miles for Richland county where hamlets are thickest, to a maximum of $5 \frac{1}{2}$ miles in Monroe county where they are the farthest apart. It should be kept in mind that these are linear air-line distances as measured

¹⁹ Edmund de S. Brunner: *Village Communities*, p. 16.

²⁰ Harlan Paul Douglass: *The Little Town*, p. 28.

by dividers on a map, scale 4 inches equal 1 mile. They do not represent the road distances from one hamlet to its nearest neighbor, which of course would be somewhat greater.

The second column in Table 2 indicates for each of the 12 counties the average linear air-line distance from each hamlet to the next nearest settlement, no matter whether it be hamlet, village, town or city. These distances naturally are somewhat shorter. The average for the 12 counties is 2 53/96 miles, while the minimum distance is 2 1/4 miles (Crawford and Richland counties) and the maximum 4 3/8 miles (Iowa county).

The third column in Table 2 shows for each of the 12 counties what purports to be the average inter-hamlet distance as derived from a formula suggested by Walenty Winid, a Polish geographer.²¹ To answer the question,

TABLE 2
Spacing of Hamlets in 12 Counties in Southwestern Wisconsin

County	Average distance in miles from each hamlet to the next nearest hamlet	Average distance in miles from each hamlet to the next nearest settlement	Average inter-hamlet distance
Crawford	2 9/16	2 4/16	6.67
Dane	2 10/16	2 8/16	5.51
Grant	2 10/16	3 6/16	6.58
Green	4 7/16	3 9/16	9.20
Iowa	5 10/16	4 10/16	11.28
Juneau	5 5/16	3 9/16	10.60
La Fayette	4 8/16	3 2/16	7.31
La Crosse	3 15/16	2 10/16	6.30
Monroe	5 8/16	3 15/16	9.23
Richland	2 7/16	2 4/16	4.67
Sauk	3 13/16	3	9.54
Vernon	3 13/16	3 13/16	6.41
Average	4 1/64	2 53/96	7.77

"How frequent are towns?" and to be able to compare regions with one another as regards the number and frequency of towns in them, is the problem which Winid attempts to solve. Basing his formula on the conclusion that settlements are ordinarily placed at the intersection points of a rectangular grid, he assumes that the best figure to use for average interurban distance is equal to the square root of the area divided by the number of settlements within that area. In other words, if D is considered to be the average distance between settlements, A the total area considered, and N the number of settlements within that area, then $D = \sqrt{\frac{A}{N}}$. It will be noted that the

²¹ Walenty Winid: The Scope of Urban Geography. *Comptes Rendus du Congrès International de Géographie, Varsovie, 1934*, Warsaw, 1937. Vol. III, pp. 171-182.

inter-hamlet distances given for each county in Column 3 of Table 2 are always larger than those showing average linear air-line distance to the nearest hamlet. That is to be expected, since the former assumes an even distribution of the small settlements over the area, while the latter, which measures the actual distance to the nearest hamlet is not required to make such an assumption. Columns 1 and 3 complement one another. As a general rule, the inter-hamlet distance as determined by the Winid formula is $1\frac{1}{2}$ to $2\frac{1}{2}$ times the average distance to the nearest hamlet.

The reason for the discrepancy between the county figures in columns 1 and 3 of Table 2 becomes more understandable after an analysis of Figure 6 showing the actual distribution of hamlets in southwestern Wisconsin. It is conspicuous that there are archipelagoes of hamlets in some places and in others open areas with few or no hamlets. The greatest general concentration is in the dissected region north of the Wisconsin River, in Richland, eastern Crawford, western Sauk, Vernon, southern La Crosse and southern Monroe counties. But even within this general region of greatest density there are clusters and lacunae. Conspicuous is the contrast between eastern and western Crawford county. Striking also is the contrast between the scarcity of hamlets in the agriculturally-poor sand-plain region of Juneau, northeastern Sauk, and northern Monroe counties, and the better, although more dissected, limestone region to the south and east. The Northwestern railway line running in a northwesterly direction from Madison to Sparta and La Crosse closely follows the western margin of the Sand Plain and approximately marks the boundary between the regions of few and many hamlets. South of the Wisconsin River where dissection is not so great as to the north, hamlets are not so numerous although here too there are archipelagoes of these settlements.

A search for coincidences between hamlet distribution and other phenomena which might give clues relative to explanation of the observed distribution has revealed no dominating principle that is generally applicable. Clearly there is a coincidence between land productivity and hamlet numbers, as is shown by the reduced number of these unincorporated places on the infertile Sand Plain. The fact that there are more to the north than to the south of the Wisconsin river might bear out Douglas' belief that numerous small trading centers are a better adjustment in rough dissected country where communication is relatively difficult. There appears to be a relatively general avoidance of railroads by hamlets, and those sections least well served by rail lines are in general the sections of most numerous unincorporated places. Of the 167 bona fide hamlets in the 12 counties of southwestern Wisconsin only 22, or 13 per cent, are at present located on railroads. A part of the answer to this coincidence, no doubt, is that those hamlets that

were served by rail lines ordinarily grew beyond hamlet size. The region of greatest density of hamlets in Richland and adjacent counties north of the Wisconsin river is poorly served by rail lines, a feature which seems to collaborate with the strong relief in making this section a particularly suitable place for hamlet development. South of the Wisconsin river, where dissection is less, the rail net is more dense, and, significantly, hamlets less numerous. Western Grant County, without rail lines and a region of uneven surface, again is a region of numerous small settlements.

TABLE 3
The Relationship of Hamlets to State and Federal Highways

County	Number of hamlets on state and federal highways	Number of hamlets off state and federal highways
Crawford	6	7
Dane	6	11
Grant	11	16
Green	1	6
Iowa	2	4
Juneau	0	6
La Crosse	7	5
La Fayette	3	9
Monroe	5	6
Richland	14	13
Sauk	1	8
Vernon	7	13
Total	63	104

There does not seem to be nearly the same avoidance by hamlets of main-traveled highways that there is of rail lines. It would seem that highways have not had the same effect upon growth in size of settlements as have railroads. Of the 167 hamlets in the 12 counties studied, 63, or nearly 38 per cent, were on state or federal highways, while 104 were not so located. These figures do suggest however that over 60 percent of the hamlets in the region were off the main routes of travel and in what is, relatively speaking, the "back country." This may indicate that in sections of greater isolation numerous small settlements with limited services are in greater demand.

From the map showing distribution of settlements (Figure 6) there is some evidence indicating that hamlets tend to avoid areas in close proximity to larger settlements and to become most numerous in the inter-village and inter-town districts. Note particularly the case of Richland county, where the small city of Richland Center is located not far from its midpoint, with numerous hamlets centrifugally concentrated away from the metropolis in the county's borderlands. Little or no evidence appears on the map, however, of a Christaller²² arrangement of settlements. To be of the Christaller

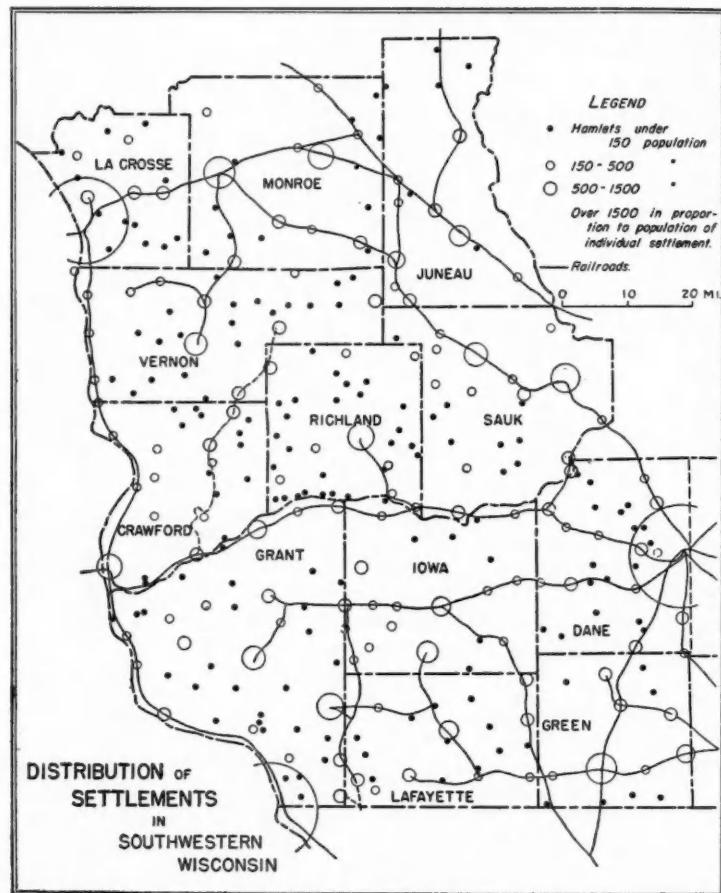


FIG. 6.

pattern would require an even distribution of settlements of various sizes, characteristics, and hinterland areas. The smallest of these would be the hamlet, providing a relatively few primary services and serving small local hinterlands, ideally of hexagonal shape (Sector 1, Figure 7). But since the

²² Walter Christaller: *Die Zentralen Orte in Sueddeutschland*, Jena, Gustav Fischer, 1933. See also, August Losch: *The Nature of Economic Regions*, *Southern Economic Journ.*, Vol. V, 1938. pp. 71-78; and Edward Ullman: *A Theory of Location for Cities*, *Amer. Journ. Sociol.*, Vol. XLVI, May 1941, pp. 853-864.

hamlet cannot furnish all of the services needed by the farmers, larger settlements or villages grow up providing these additional services (for example, doctors, hospitals, implement stores, drugstores, etc.), and serving the farmers of a more extensive area hexagonal in shape, and also those people living in adjacent hamlets. This larger area served by the community of a size next larger than hamlets is shown in Sector 2, Figure 7. By such a scheme Christaller builds up a hierarchy of settlements of different sizes and functions (Sector 3, Figure 7). This distribution of settlements will determine the character and pattern of the transportation net made up of a system of primary, secondary, and local roads and railways, (Sector 4, Figure 7).

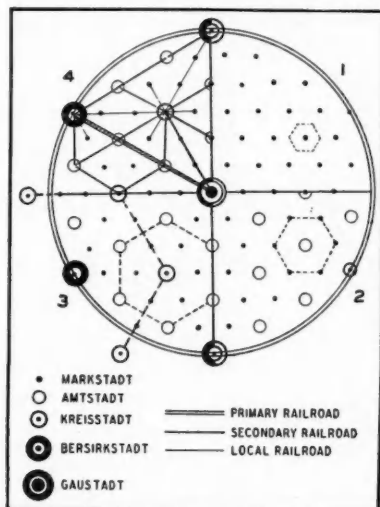


FIG. 7.—Theoretical distribution of trade centers. (Based on diagrams made by made by James A. Barnes, after W. Christaller. Courtesy of George Wehrwein and *Economic Geography*.)

This hierarchy of evenly distributed settlements and lines of communication is disturbed by natural factors, locational advantages for manufacturing, and through lines of transportation. In the region being studied the hilly and dissected nature of the land surface, affecting as it does the natural routes of travel, has been a major element in preventing such an ideal arrangement as Christaller suggests. Military Ridge, which is the crest of the Galena-Trenton escarpment, the Wisconsin River Valley, and the Mississippi Trench along the western border are the three major natural routes of communication influencing settlement development.

SIZES OF HAMLETS

For the definition of a bona fide hamlet presented earlier in this paper, one of the essential elements was a population requirement stipulating not fewer than 4 families nor more than 38. But within the limits named it is essential to know what the most common sizes are and how the 167 hamlets are distributed between the two extremes. Table 4 shows the distribution. It is very conspicuous that the smaller sizes greatly predominate. Using 7 size groups with 5 units in each, 66 of the total 167 hamlets, or 39.5 per cent, fall within the first group having between 4 and 8 residences (Table 4).

TABLE 4
Number of Hamlets and Their Residences in Different Size Groups

Size groups	No. of hamlets	Per cent of total	Total no. of residences
4 to 8 residences	66	39.5	390
9 to 13 "	34	20.4	364
14 to 18 "	26	15.6	415
19 to 23 "	14	8.4	289
24 to 28 "	13	7.8	341
29 to 33 "	8	4.8	248
34 to 38 "	6	3.6	217
Total	167		

Thirty-four, or 20.4 per cent, are within the second group, having between 9 and 13 households, and 26 or 15.6 per cent in the third group with 14 to 18 residences. In other words, slightly less than 25 per cent had more than 18 residence units. Clearly it is the exceedingly small hamlet, offering relatively few services, that the farm population can afford to support in greatest numbers. Not only are there a greater total number of small hamlets, but also the total number of residences, and therefore total population, is higher in the small-sized hamlets.

THE SERVICES OR FUNCTIONS OF HAMLETS

A very elementary and fundamental form of arrangement within both inorganic and organic units is the accretion of a mass about a nucleus or core. This is what Christaller calls the principle of centrality. Hamlets, tiny though they are, still give evidence of centripetal forces. A business unit, a church, a school, a cheese factory—these and others may serve as accretion centers. Of the 167 hamlets mapped in southwestern Wisconsin, only one was composed entirely of residential units; all of the others had some element of centralization. Five only of the 167 were totally without some form of business, and of these, four had other elements with centripetal power such as a church, school, or town hall. The fact that 162 or 97 per cent

possessed one or more places of business clearly establishes the fact that these tiniest of agglomerations are to an unusual degree commercial service centers for the buying and selling operations of the surrounding farm population.

The Residential Function

No comprehensive survey of a quantitative nature was made to determine the occupations of the families who live in these hamlets. Detailed case studies were made of a very few hamlets (see a later section of this paper, page 63) to determine whether there seemed to be anything unique in terms of occupational composition not brought out through the mapping procedures. Inquiry from residents in more hamlets served to substantiate the evidence acquired from case studies and mapping, that these insignificant settlements are represented by a great variety of occupations. Clearly the professional group so common in larger settlements is almost entirely absent. Artisans, tradesmen, laborers, and retired farmers make up the bulk of hamlet populations. The homes of these hamlet dwellers give evidence of the considerable variety of forms, quality, and sizes characteristic of farm and village dwellings in the general region of the upper Mississippi Valley. They are no better and no worse than those found on the surrounding farms. ■, T, and ▮ houses predominate. Frame construction is greatly in the majority.

At least two elements of the hamlet residential function stand in contrast to those of larger settlements: (1) more of the residential units in hamlets, as well as serving to shelter a family, also house business or manufactural functions, and (2) a modest percentage of hamlet homes are those of active farmers, and, where this is the case, the home is one unit of a farmstead with all its barns and outbuildings. Combinations of the residences with general stores, and grocery stores, filling stations, cheese factories, and taverns are common. Considering the small volume of business done by these commercial units, their combination with the residence seems to be a very satisfactory arrangement. Continuous supervision of the small business is unnecessary so that household duties, gardening, and the like can be carried on simultaneously with the supervising of the selling of goods or services. Not infrequently the women of the house combine operation of the business with domestic duties while the husband and older sons may be engaged elsewhere. Of the 2265 residences mapped in the 167 hamlets studied, 212, or 9.4 per cent, combined business with residential function (Table 5). On the average, 1.3 residences in each of the 167 hamlets were combined with some business or processing enterprise (Figs. 8 to 14).

It would be so unusual as to be striking to see within a mid-western village or town a farmstead with its collection of barns, sheds, wind mill, silo,

and cattle and hog yards. Such a scene is fairly common in hamlets. This is not to be wondered at when one considers how near to being rural these settlements are. Urban squeamishness to barnyard odors has not developed to the point where these things seem particularly objectionable. Moreover, until incorporation takes place hamlets are not a political organization so that there is no way of outlawing farmstead functions even though the citizens of the hamlet might desire it. In the 167 hamlets studied, containing as they did 2265 residences, 280 were the homes of active farmers. This

TABLE 5

Summary of Important Statistical Facts About 167 Hamlets in 12 Counties of Southwestern Wisconsin

Total occupied residences	2265
1. Residences used as living quarters only	2053
2. Residences in combination with business	212
3. Farm residences	280
Vacant residences	57
Total business enterprises	670
Total business establishments	461
Stores (general and grocery)	171
Filling stations	247
Garages	68
Taverns	98
Blacksmith shops	39
Schools	97
Churches	85
Town halls	39
Halls (used for social purposes)	25
Cheese factories	65
Creameries	15
Feed mills	17
Saw mills	3

means that 12.4 per cent of the total hamlet residences were farmstead dwellings while each hamlet had, on an average, 1.7 farm homes with their attendant barns and out-buildings. It is probably good for these small settlements to number active farmers among their citizens and to be in close physical proximity to farmsteads. The result will be to keep hamlets rural minded. Unfortunately, although American villages and small towns chiefly serve, and are supported by, farmers, their citizens think they belong to an urban rather than a rural order of life. In sympathy and ambition they tend to face away from the country and to envy and imitate the city even though this is in clear contradiction to their economic relationships.

BUSINESS FUNCTIONS

In Table 5 is set forth an analysis of the different kinds of business units found in the 167 hamlets mapped and studied. A total of 670 businesses were mapped, or an average of four per hamlet. The largest number found in any one settlement was 13. But, although there are 670 businesses, there

are only 461 business establishments, or 2.8 per hamlet. The explanation of this apparent anomaly is that business establishments in hamlets commonly carry on more than one type of business. Thus a tavern or general store often has gasoline pumps and sells motor oil, or a tavern may provide meals. Again it is the small volume of trade carried on that creates the incentive for developing more than one business in a single establishment.

Most numerous of all hamlet businesses is that of the gasoline filling station. One should guard against conjuring up a picture of the type of elaborate filling station establishment to be seen in towns and cities. Rarely is the hamlet filling station a separate establishment. Characteristically it is only gasoline pumps, racks of motor oils and greases, and a limited number of automobile accessories such as fan belts, and spark plugs—all of these items in association with some other business. Nevertheless, the fact that there were only 24 hamlets out of the 167 in which gasoline pumps were not conspicuous, points to the importance of the automobile in hamlet business. Here also is a relatively new business service open to hamlets that has tended to compensate for the decline of others such as the blacksmith shop and the inn. There were on the average 1.5 filling stations per hamlet.

Next to filling stations in point of numbers is the general store. A few stores handle chiefly groceries, and where this is the case they are small in size. Much more common is the type whose shelves carry everything from thread to cheese. From them come odors fearfully compounded from oil cloth, kerosene, coffee, rope, fruit and scores of other aromatic substances. From the beginnings of settlement in the Middle West, the cross-roads general store has been a ubiquitous institution in that part of the country. Its importance may have waned to a degree because of the easier accessibility to farmers of villages and towns where a better variety of wares is offered, but it still remains a pillar of strength in the life of these cross-roads settlements. In the face of improved transportation, the lack of a wide range of selection and the absence of quality goods in the hamlet's general store is offset by lower overhead and reduced operating costs which make it possible to sell cheaper. Within the 167 hamlets mapped there was a total of 171 general stores (including a few specialized in groceries), or an average of slightly over 1 per hamlet (Figs. 8 to 14).

Nearly three-fifths of the hamlets have taverns and a total of 98 such establishments was counted. Liquors are a type of commodity that the buyer doesn't want to travel far to get, so that the tavern is a type of business particularly suitable to a small local trade center. Blacksmith shops (39 in number) are nowhere nearly as numerous in hamlets as they were a few decades ago, but the garage has come in to take its place. Garages today are considerably more numerous (a total of 68) than blacksmith shops.

Except for horse shoeing, the garage performs many of the services, such as repairs for farm machinery, formerly undertaken by blacksmith shops. Sometimes, in the field, it was difficult to know whether a particular establishment should be classified as a garage or a blacksmith shop. Many of the garages are very unpretentious affairs, looking not at all unlike the usual blacksmith shop.

Other types of business are poorly represented in hamlets, although there is a relatively long list of these less common types which are found in a few of the settlements. In this list barber shops are the most numerous, 10 in all, followed by hardware stores (7), coal yards (7), lumber yards (6), farm implement stores (5), feed stores (4), banks (3), meat markets (2). Post offices were noted in only 5 hamlets, but, since this service is not always conspicuous, some may have been missed. Nevertheless, it is clear that here is a service very common to hamlets of earlier decades, in fact one of the potent factors in their development and growth, that as result of rural free delivery service has markedly waned. One dentist, two telephone offices, one night club, one cobbler, one veterinary, one paint shop, one wood-working shop and one chick hatchery complete the list.

Processing Functions

Practically all of the processing plants located in the hamlets studied are those whose raw materials are produced on the nearby farms. Here again, as was true of the business units, the hamlet is serving the farm population.

Most common among the small-scale factories characteristic of hamlets is the cheese factory (65 in total). Thirty-nine per cent of the hamlets boast such milk processing plants. Requiring as they do only a relatively small amount of raw material for their efficient operation, these inconspicuous plants are particularly well suited to location in hamlets. And when the hamlet cheese factory is centrally located for the milk-contributing farmers, it is a convenience for the latter, while on the enforced daily trip to the cheese factory, to find at hand the services of stores, garage, filling station, or blacksmith shop. It is the usual thing for the residence of the cheesemaker's family to be included under the same roof as the factory.

Creameries, which are larger processing plants, requiring for profitable operation the milk from a greater cow population, are many fewer. Only 15 such plants were discovered in the whole 167 hamlets. Sawmills, which were one of the more common functions represented in hamlets in the late decades of the last century, are now very scarce. Only 3 are operating at the present time. Feed mills, 15 in number, although more numerous than sawmills, are surprisingly few considering the essential services to farmers that they perform. A few of the mills still make flour. Relic features of both types of mills, powered by water wheels, are common in hamlets.

Sometimes it is the mill itself that still stands, more often only the mill pond or the race.

Congregational Services

Other than business and processing plants serving the surrounding farmers, hamlets also possess other institutions or establishment with centralizing or centripetal power. Ninety-five country churches and 65 rural schools were found within the 167 hamlets mapped. Other than stores, filling stations, and taverns, schools and churches are the most common of hamlet institutions. Preachers and teachers are almost the only professional people found residing within these small settlements. Town halls were characteristic of about one-quarter of the hamlets (39) while social halls (fraternal halls, dance halls, etc.) were mapped in slightly more than one-seventh (25).

Distribution of Functions within Hamlets

The diminutive size of most hamlets, the few business places they possess, and the customary lack of any street grid, precludes the development of a business-core area such as is characteristic even of small villages. Such few commercial or processing establishments as a hamlet may possess (average 2.3 per settlement) appear to be located rather haphazardly and with little or no attempt at clustering. Even when a hamlet is located at a road intersection, the corner sites do not offer a great advantage for a business, for these small places do not cater to fast-moving through traffic. A few score yards further, one way or the other, is not of much significance to the more leisurely moving farmer.

Case Studies

In order to gain more intimate insight into the occupational composition of hamlets, detailed case studies were made of a few of them. Summaries of two of these detailed analyses are presented.

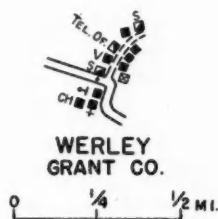


FIG. 8. See legend on p. 69.

1. Werley is a very small hamlet in northern Grant County (T. 6 N.-R.

3 W.-Secs. 5, 6). It is located in one of the deep valleys of the Galena Escarpment draining toward the Wisconsin River. County Highway K serves the little community and is its main street, although a part of the hamlet stretches northeastward from K along a dead-end dirt road. Twenty-seven inhabitants, included within 8 families, comprise the population of Werley, 12 of the 27 being children. The occupations of the breadwinners in the eight families are as follows:

Number of families	Occupations	Number of people in family
1	General store operator	4
1	Telephone office operator (in home)	2
3	Day workers (in one home groceries are sold)	10
1	Filling station attendant	3
1	Cheese maker	6
1	Blacksmith	2
—	—	—
8		27

Werley hamlet has 5 business enterprises, one of these a general store with gasoline pumps, a separate filling station, a grocery store connected with a residence, and a blacksmith shop. The general store's proprietor has his residence above the place of business. In addition to these there is a telephone office, associated with one of the residences, a cheese factory, and a church (Fig. 8). There are five residences not associated with business establishments and one vacant residence.

2. *Mount Vernon* in western Dane County (T. 6 N.-R. 7 E, Sec. 34) is located in a broadly open valley on the back slope of the Galena Escarpment in the midst of a first-class farming area. County trunk Highway G serves as the main street. A majority of the hamlet's 106 inhabitants (74 adults, 32 children) are of Swiss extraction. On the whole the settlement looks prosperous and well kept. The business places, church, and school are considerably better than average, and the houses and lawns are in good shape. Sidewalks are present throughout a large part of the settlement. Thirty-five families comprise the hamlet. Three of these are farm families and 6 are retired farmers and their families. The occupations of the family heads in the hamlet are as follows:

No. of families		No. of people in family
6	Retired farmers	11
3	Tavern operators	4
1	Miller	2
1	Hired man	2
1	Telephone workman	4

No. of families		No. of people in family
1	Garage man	4
3	Farmers	13
1	Blacksmith	6
3	Widows	4
5	W.P.A. workers	28
1	Retired cheese maker (on government pension)	2
1	Cheese factory operator	3
2	Farm machinery salesmen	7
2	Road patrolmen	5
1	Barber	3
1	Merchant (general store)	2
1	Carpenter	1
1	School teacher	4
1	Hired man	1
35		106

There are 28 occupied houses, one vacant one, and one trailer house (Fig. 10A). Five houses have two families. Two of the residences are in combination with farmsteads and two others are combined with places of business. Nine businesses are represented (store, grist mill, 2 filling stations, blacksmith shop, garage, cheese factory, 2 taverns) occupying six separate establishments. Oddly located in the center of the hamlet are sheep feeding yards belonging to one of the retired farmers.

Hamlet Functions Today as Compared with Fifty Years Ago

Because of the lack of specific information relative to the kinds of businesses and other centralizing institutions in particular hamlets some decades ago, it is impossible to make a precise comparison of hamlet functions then and now. Based upon fragmentary data it seems reasonably certain that hamlets, for example in 1890, were on the whole more complete service centers for the farming population than they are today. In view of the inferior communications of that period this does not seem unusual. Lumber, grist and flour mills, blacksmith shops, and post offices were much more numerous, and there was a fair number of harness shops, wagon shops, hotels, drugstores and doctors—features and services rarely found in modern hamlets. Churches and schools, and general stores were common at both periods. On the other hand, cheese factories, taverns and saloons, filling stations, and garages all seem to be more numerous in the modern hamlets. It is quite impossible to judge whether there has been a total decline in the centripetal powers of hamlets in general. But at least there have been important changes in the kinds of services performed, some having waned or

even disappeared while other new ones have come in to take their places. In all probability the changes in kind have been greater than the changes in amount.

GROUND PLANS OF HAMLETS

The most fundamental element of ground plan in hamlets is the public highway. Hamlets belong to the highways and the large majority of them have no street patterns apart from the thoroughfares on which they are located. In this feature the hamlet is unlike other agglomerated settlements. Even the small village ordinarily has a conspicuous set of village streets distinct from the highways to which it is attached. This separate circulatory system designed for local movement is largely lacking in hamlets. Those few that have such are either adolescent villages or else they are decadent settlements in which the local street pattern is a relic of an earlier day when the plans were made for a more pretentious growth than actually occurred. It becomes clear why *haufendorf* form is almost completely lacking in hamlets.

This contrast in ground plan between hamlets and other clustered settlements reflects the weak centripetal power of the former. Depending more completely than other settlements upon farmer support, the hamlet's public service units are placed easily accessible to rural traffic. A business proprietor of one of these small establishments finds it a great convenience to live within easy call of a customer. The result is a frequent combination of residence and business functions, or at least very close proximity of residence and store. Homes as well as places of business are therefore along the highway. Until recent years, with the development of automobile travel, the highway was not an objectionable location for residences. In fact the quiet highway with its slow horse-and-wagon traffic was a preferred location. It permitted an easy exchange of countryside gossip and helped to relieve the monotony of rural living. Speeding cars and trucks with their noise, dust, and danger to pedestrians, especially children, make present-day highway location of hamlet residences less desirable.

The small size of hamlets and their sprawling nature make it difficult to classify their ground plans on the basis of morphology alone. Due to the small number of buildings involved, and their irregular and wide spacing, the arrangement does not always exhibit a plan, if one blanks out the highways on which they are located. For this reason the classification of hamlets here used involves the road plan as well as the hamlet morphology. Compactness is not necessary in such tiny settlements where land has rural rather than urban values. As they grow in size they do it by an increase in number of units rather than through an enlargement of a single element.

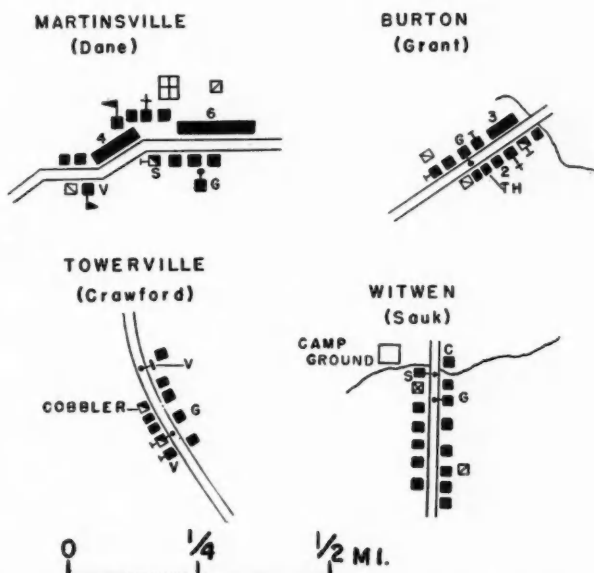


Fig. 9a.—Figures 9 to 14 show representative ground plans, together with the distribution of functional units, in six different classes of hamlets. Fig. 9a illustrates the linear type of hamlet not located at road intersections. See legend on p. 69.

Types of Hamlet Ground Plans

1. Linear or shoestring plan.
 - a. Not associated with road intersections (Fig. 9a).
 - b. Associated with road intersections (Fig. 9b).
 - c. With bends (Fig. 9c).
2. Radial plan.
 - d. Along 4 or more roads (Fig. 10a).
 - e. Along 3 roads (Fig. 10b).
3. With some evidence of a street pattern distinct from highway (Fig. 11).
4. Two-cluster (Fig. 12).
5. Insignificant hamlets too tiny to have a distinct form (Fig. 13).
6. Complex (Fig. 14).

Linear Plan. Hamlets with linear form predominate, 50 of the 167, or 30 percent, approximating this shape, (Figs. 9a, 9b, 9c). Of the 50 so classified, 36 were at road intersections so that the settlements were not

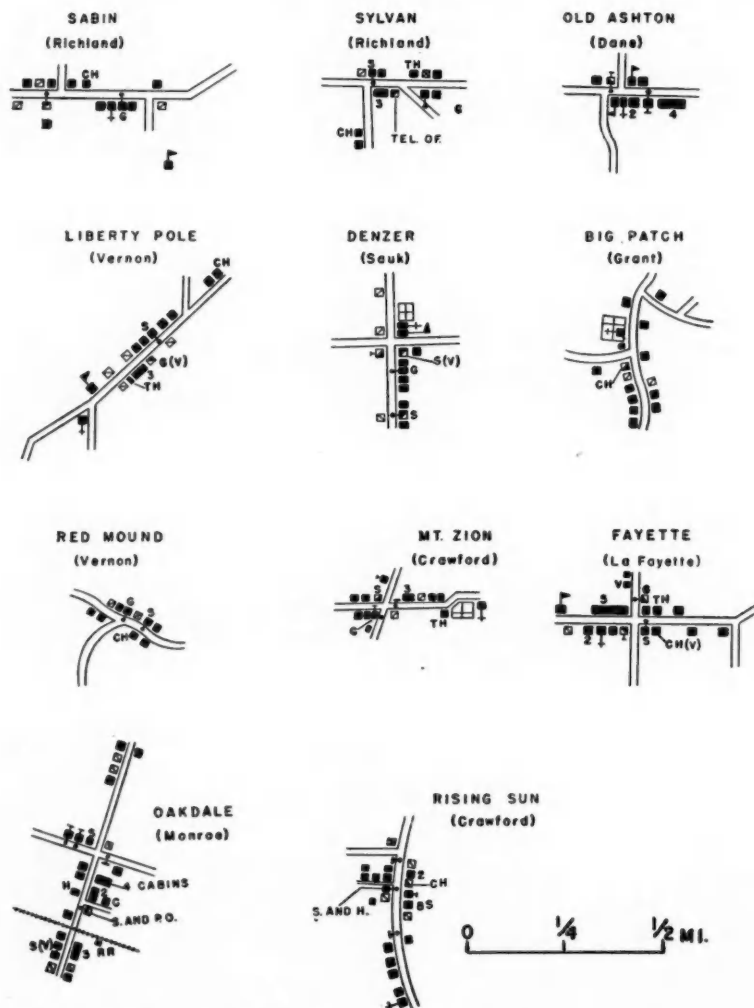


FIG. 9b.—Representative hamlets of the linear type located at road intersections.

obliged to develop linear pattern (Fig. 9b). No very good or consistent reason was discovered why buildings had not developed along the other highways converging on the point of intersection. But in spite of the fact that linear plan has been maintained even in the presence of road intersec-

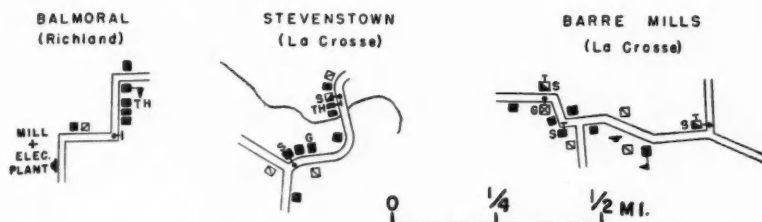


Fig. 9c.—Representative hamlets of the linear type associated with crooked roads.

LEGEND

■ NON-FARM RESIDENCE	PO ■ POST OFFICE
■ GROUP OF RESIDENCES	☒ BLACKSMITH
▣ FARMSTEAD	BS ■ BARBER SHOP
▣ COMBINATION RESIDENCE AND BUSINESS	— ■ TAVERN
⊥ FILLING STATION	▲ SAW MILL
S ■ STORE	▼ GRIST MILL
G ■ GARAGE	V VACANT
▼ ■ SCHOOL	TH ■ TOWN HALL
+ ■ CHURCH	H ■ HALL
C ■ CREAMERY	RR ■ RAILROAD
CH ■ CHEESE FACTORY	☐ CEMETERY

tions, this in no way diminishes the significance of the road crossing as a favorable location for settlement growth. Linear form in this instance does not refute the importance of converging highways. Only 14 of the 50 linear hamlets did not have the benefit of nodal location (Fig. 9a).

Radial Plan. Because of the importance of road intersections in the location of hamlets one might expect a radial form of settlement with buildings developed along the converging highways to be a particularly common ground plan. Only 24 out of the total of 167, or 14 + per cent, exhibit such a conformance with road pattern however (Figs. 10a, 10b). A part of the answer to this seeming anomaly is the fact that only hamlets of at least fair size have enough buildings to permit of extending a row of them out along the several converging roads. In the group of 167 settlements studied, actually only 39 had 20 or more residences, so that a large majority of the hamlets scarcely had enough buildings to make a clear-cut radial pattern possible. Of the 24 hamlets with pronounced radial form, 15 had 4-point or more convergence (Fig. 10a), while 9 had 3-point (Fig. 10b).

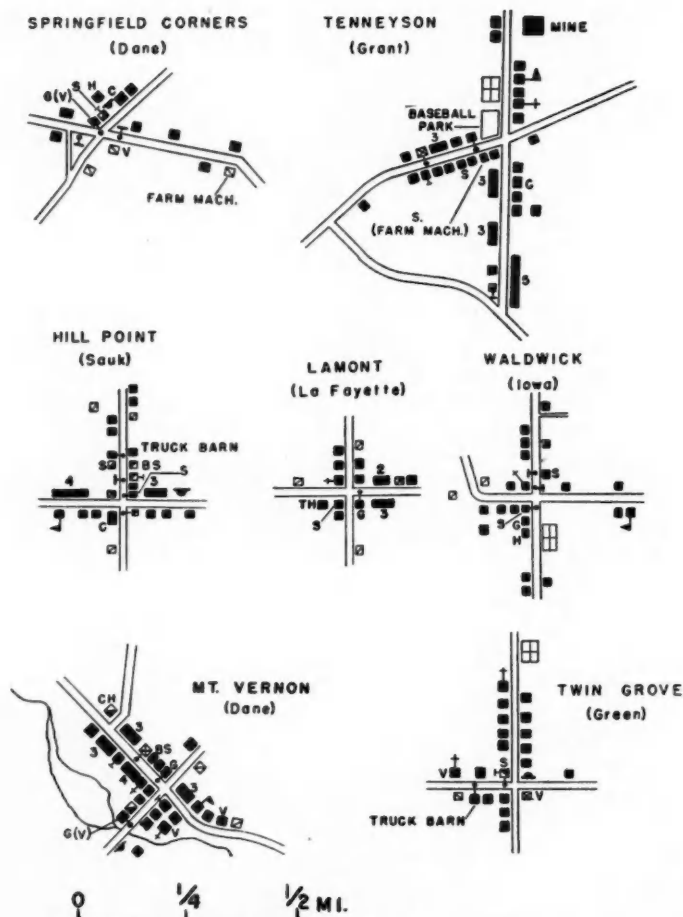


FIG. 10a.—Representative hamlets of the radial type associated with an intersection involving four or more roads.

Having Streets in Addition to Highways. Thirty-six of the 167 hamlets have a semblance of street pattern apart from that of the general highway system (Fig. 11). In a considerable number of the cases so catalogued the additional street or streets were so short or so meagerly inhabited that one might properly question the wisdom of including them within this group. Rarely is there a genuine grid of streets, although in a few instances this is

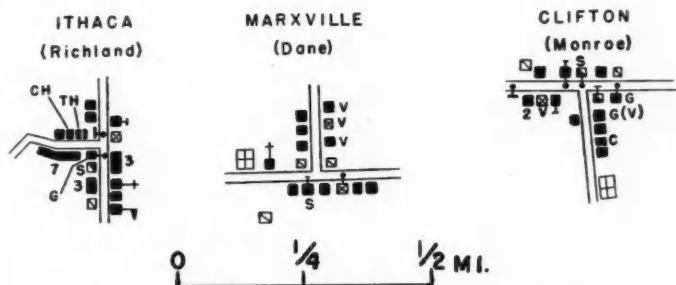


FIG. 10b.—Representative hamlets of the radial type associated with an intersection involving three roads.

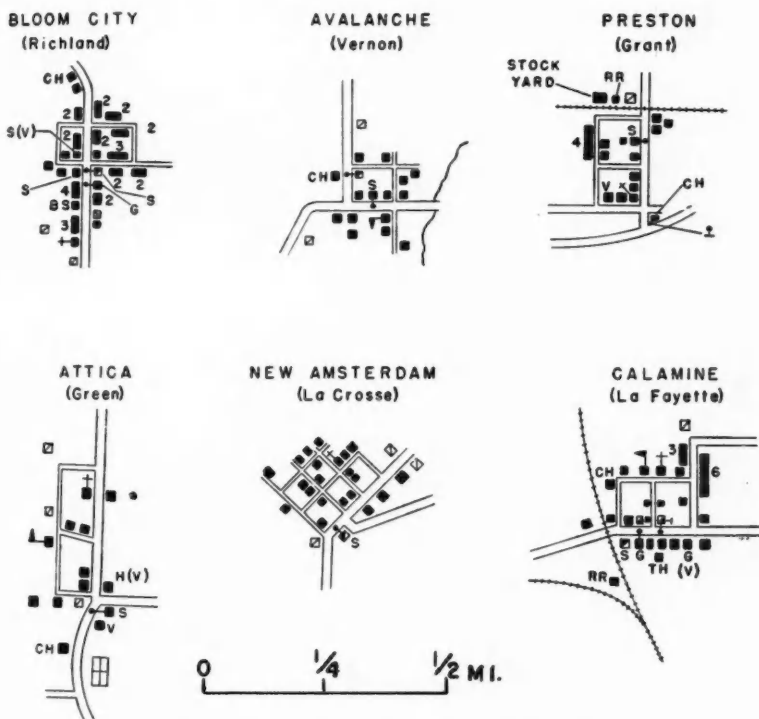


FIG. 11.—Representative hamlets having some evidence of a street pattern distinct from the highways on which they are located.

the case. Usually the addition to the road pattern consists of a single side street or perhaps a square of which the highway forms two sides (Fig. 11). It is likely that some, if not most, of these streets which are accessory to the highway system are relics of promoters' plans whose ambitions have never been realized. Numerous of these plans can be verified from old atlases and from county histories.

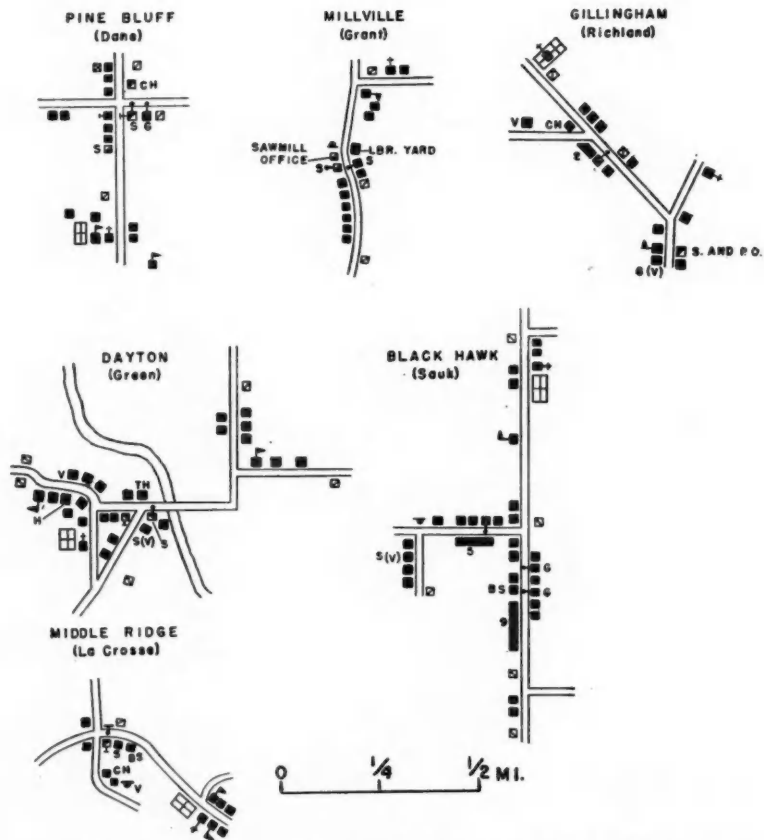


FIG. 12.—Representative hamlets of the binodal or two-cluster plan.

Binodal Hamlets. Only 6 hamlets are of this type (Fig. 12). It may well be questioned as to how one can be sure he is not dealing with two settlements rather than with a binodal type. Best proof is that the same

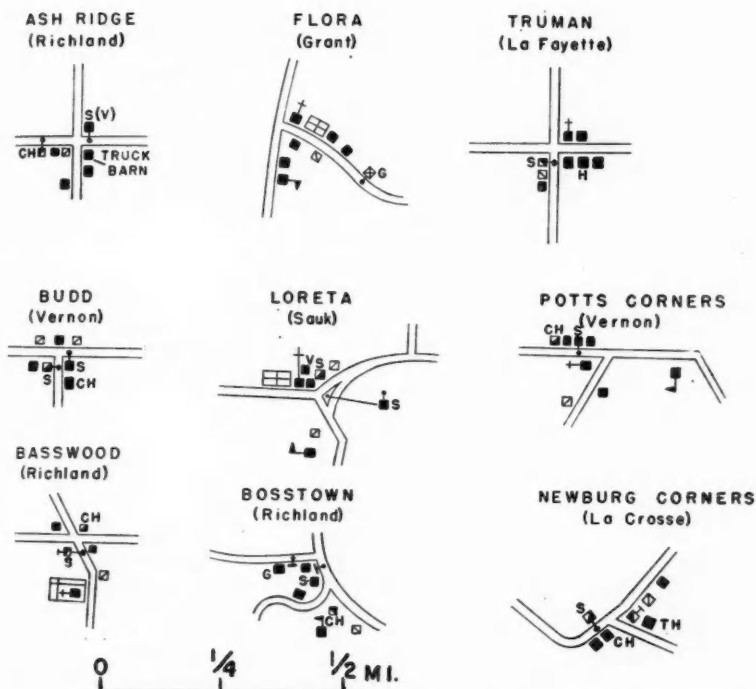


FIG. 13.—Representative hamlets which are too tiny to have a distinct ground plan.

name is common to both nodes. Where two settlement clusters do exist, ordinarily each is grouped about distinct centralizing functions. In five out of the six hamlets belonging to this class, the secondary cluster was developed about a church or school or both.

Insignificant Hamlets with Little or No Pattern. In settlements with fewer than 8 buildings it is dubious whether an attempt should be made to recognize ground plan. Thirty-two such hamlets were catalogued, almost all of them located at road intersections (Fig. 13).

Complex Form. Nineteen of the 167 hamlets have ground plans which do not fit well into any of the previously designated simple classes (Fig. 14). In general their plans are relatively complex, and because they are nonconformal in character they have been put into a group by themselves. In a number of cases the complexity grows out of such revolutionary events as the coming of a railroad or the carving of a new thoroughfare in which the earlier right-angled turns were avoided.

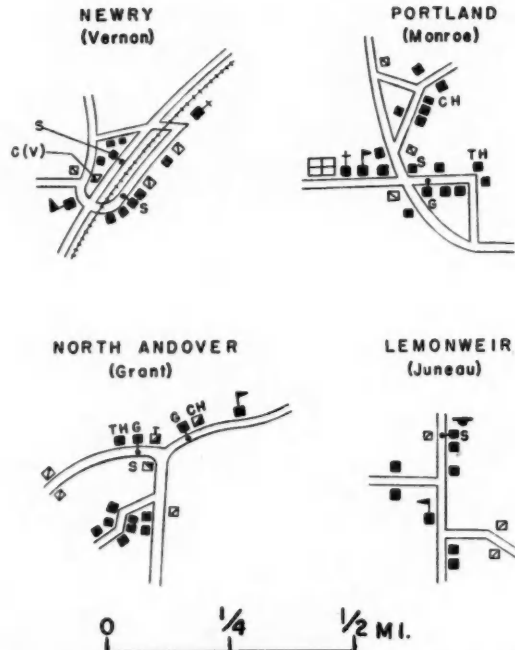


FIG. 14.—Representative hamlets of the complex-plan group.

THE HAMLET AS A UBIQUITOUS AMERICAN INSTITUTION

According to a count made from the Rand McNally atlas (1938 edition) there are in the United States 93,466 settlements with populations of 150 or less. This count includes not only those places whose populations are given as 150 or less, but also those merely named and for which population figures are not given. This is the "unselected" group of hamlets referred to in the earlier parts of the paper. It contains no doubt the names of many places that have no existence as genuine settlements. The "selected" group of hamlets, which has been defined as those with populations between 20 and 150 inclusive, contains 37,570 names. As far as bona fide hamlet settlements are concerned, although the "unselected" count is probably far too large, this "selected" count almost certainly errs in the opposite direction, for there would be a natural tendency to omit population figures for large numbers of these little places where there was difficulty getting what seemed like reasonable estimates. One thing is clear, however; except for farm-

steads the hamlet is by far the most ubiquitous settlement type in the United States.

Fig. 15 shows by means of dots the distribution of hamlets whose populations are between 20 and 150 inclusive (data source, Rand McNally Commercial Atlas of Foreign Countries, 1938). The county was used as the basic unit for recording the number of hamlets. For a number of reasons no comparable map was made showing distribution of the larger group of unselected hamlets, although the data for making the map were prepared and placed on a base. The general pattern of distribution for the unselected hamlets resembled greatly that shown in Fig. 15, but with a greater spottiness. Perhaps my personal conviction, as a result of field experience in mapping hamlets, that the unselected list is greatly padded as far as genuine settlements is concerned, leads me to depreciate the relative value of a map showing this larger group.

Fig. 15 is best analyzed in conjunction with the distribution maps, Figs. 16, 17, 18, and 19 which show hamlets in their relationship to area and to farm population. On the four ratio maps the unit for distribution is the state. On Figs. 16 and 17 showing by ratios the distribution of hamlets with respect to area, generalized isarithms have been added, the latter being based upon county data. I desire to reemphasize the fact that the isarithms are somewhat generalized, for to have drawn them with precision would have resulted in too many closed isarithms encircling individual counties. Such a map containing numerous isolated spots of high and low ratios confuses the broader generalizations and renders the map less serviceable. An attempt was made to add isarithms to the ratio maps showing hamlets in relation to farm population (Figs. 18 and 19) but without success, due to the extraordinary contrasts in the ratios between nearby counties and the lack of orderly gradients. Isolated spots of high and low ratios were ever so much more conspicuous than on the $\frac{\text{area}}{\text{hamlets}}$ maps (Figs. 16 and 17).

From Fig. 15 it can be observed that the numbers of hamlets show certain very general relationships to population distribution. For example the humid East has many more of these small settlements than the dry West. But over the humid East, on the other hand, there are relatively wide departures from a distribution based upon population. Nevertheless, they are common to all parts of the country. Certain distribution patterns are to be observed. Throughout the dry West linear distribution is very conspicuous. Railroads, principal highways, and irrigated valleys appear to be the lines along which the little settlements are strung. The humid East on the other hand lacks any such easily described pattern. There the spread is more uniform to be sure, but still with a considerable patchiness. General

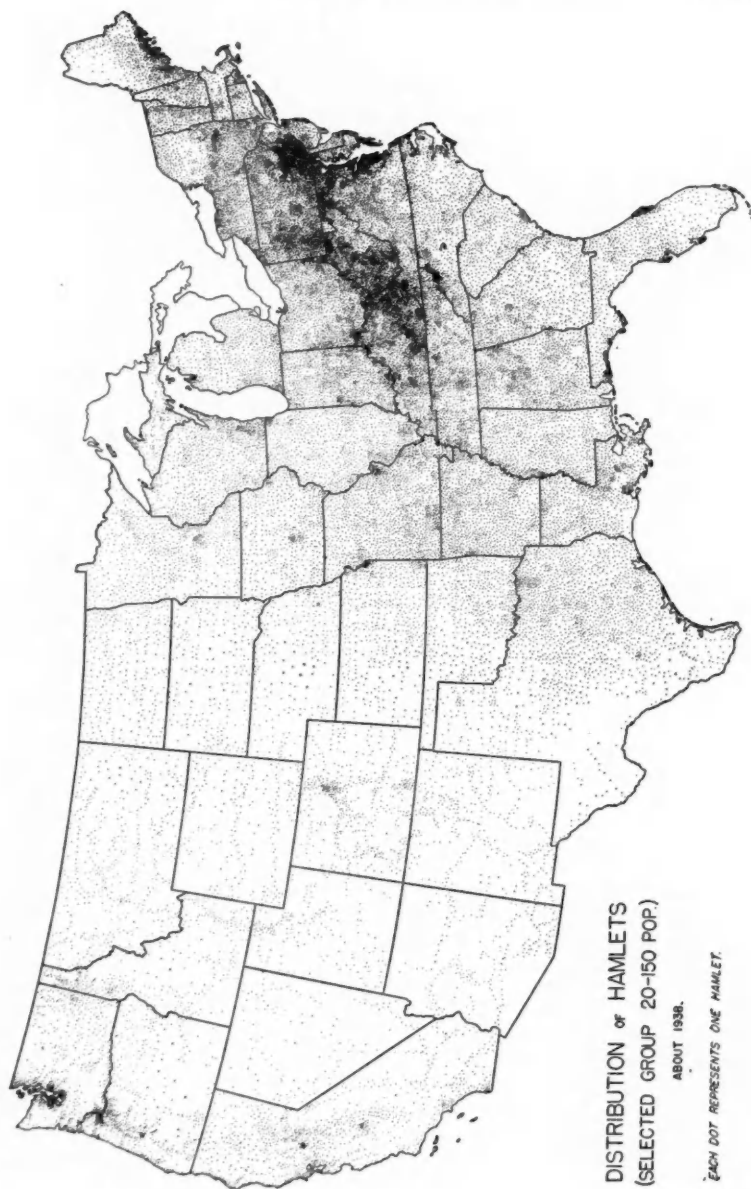


FIG. 15.

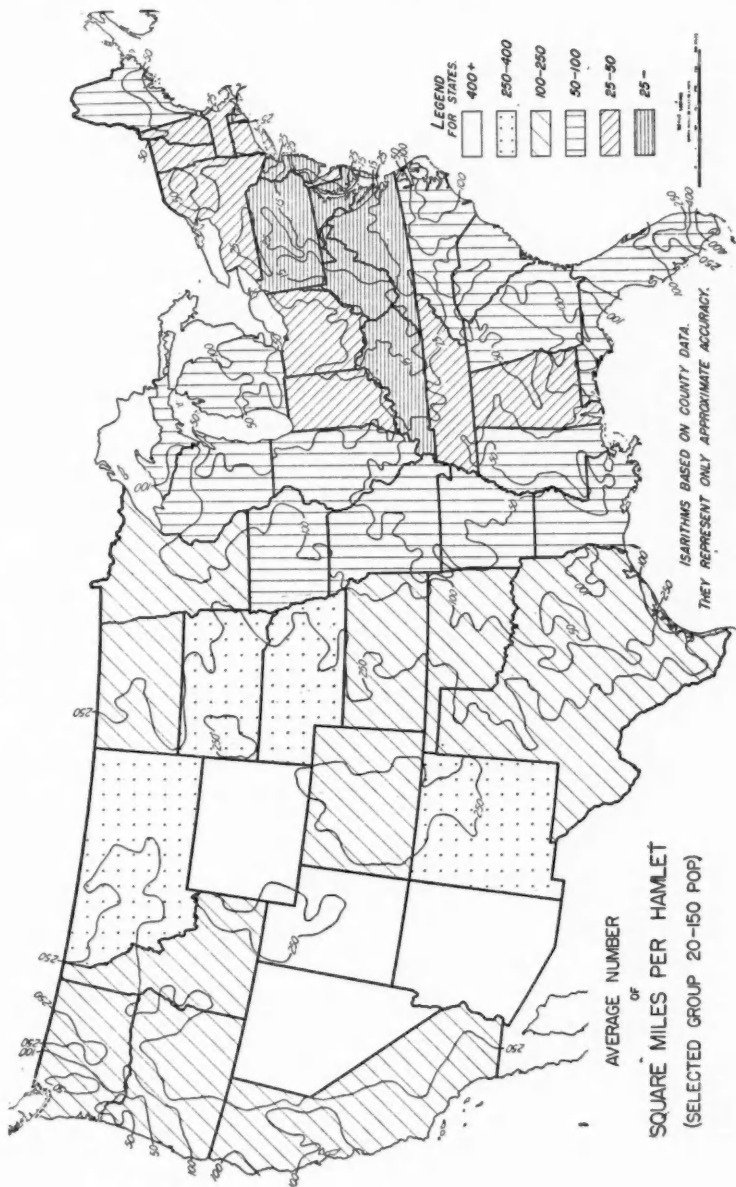


FIG. 16.

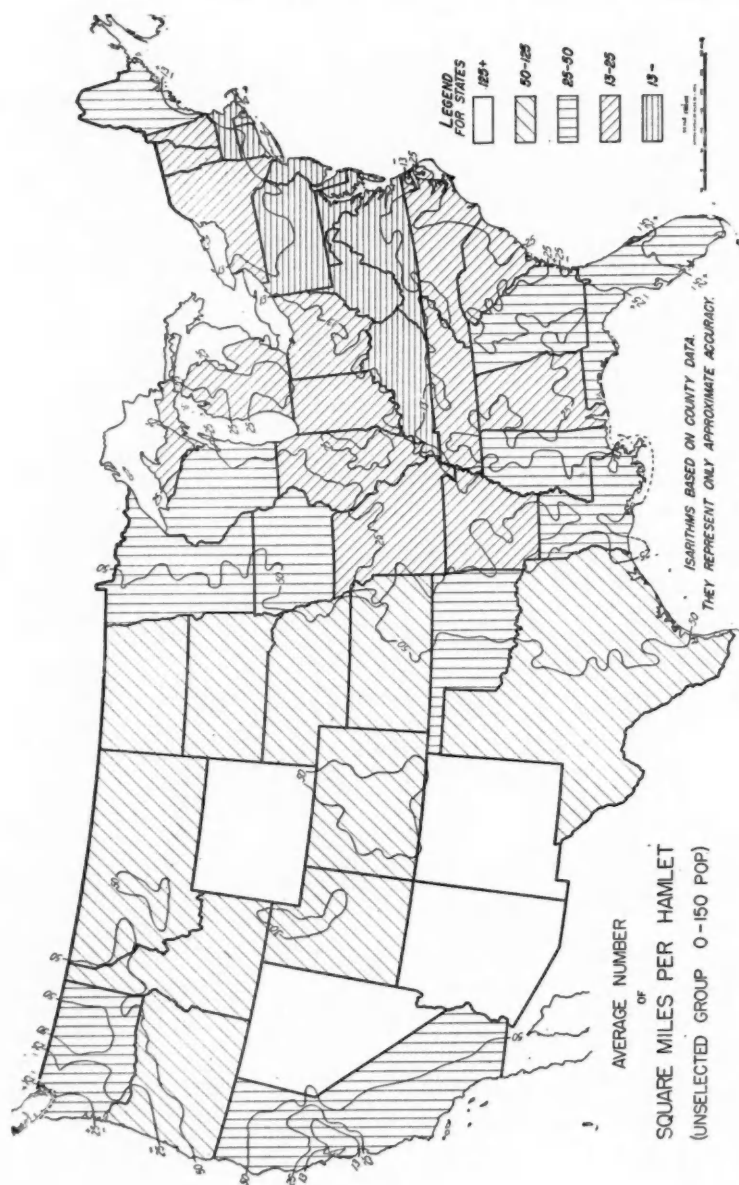


FIG 17.

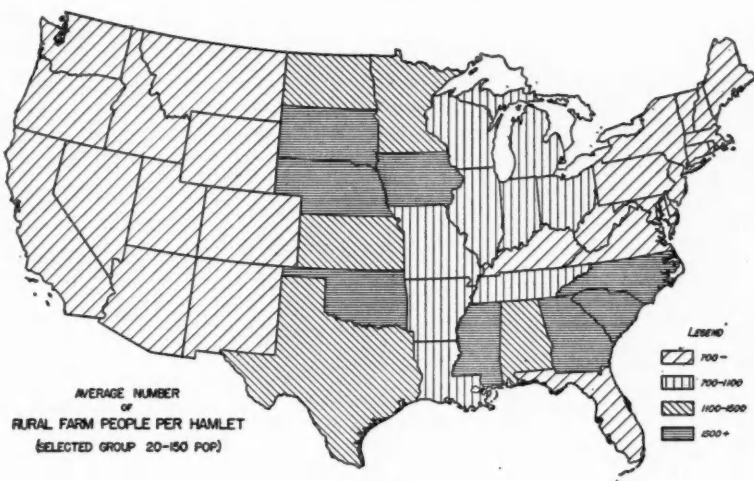


FIG. 18.

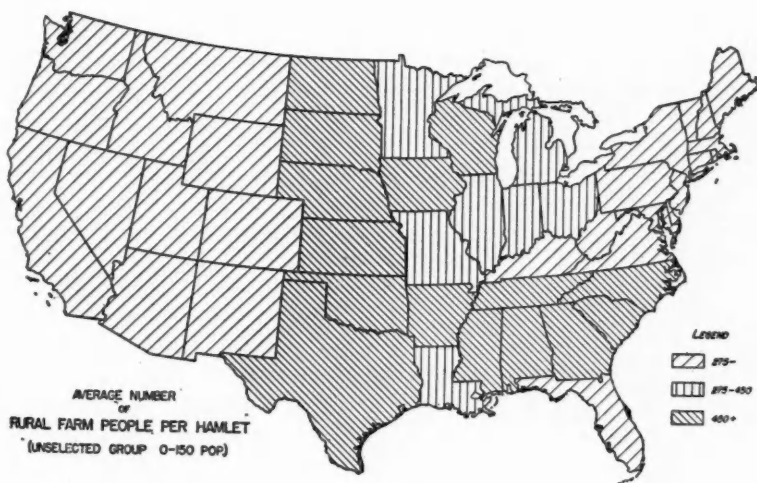


FIG. 19.

rules explaining areas of high and low numbers are difficult to formulate. Thus, while the rough lands of the Adirondacks and northern Maine and New Hampshire have relatively few hamlets, the hill country of western Pennsylvania, West Virginia and Kentucky have an unusually large num-

ber. Moreover, around certain large cities—Minneapolis, St. Paul, St. Louis, Kansas City, and Des Moines, for example—small settlements appear to be distinctly concentrated, while the areas near to Chicago, Boston and New York show no such thickening.

Numerous problems in hamlet density are revealed in Figs. 16 and 18. Regions of highest density are: (1) southeastern Pennsylvania, Maryland and coastal Virginia; (2) western Pennsylvania, western West Virginia, and eastern Kentucky. Within these areas there is on the average, except in a few counties, a hamlet for each 15 square miles. From Fig. 18 showing by states the number of rural farm folks per hamlet the striking fact is that there are the largest numbers of hamlets in proportion to the farm population in, (1) the dry West and (2) in the northeastern part of the country (New England and Middle Atlantic States), regions that are very unlike both in natural and cultural endowments. On the other hand it is in such unlike regions as the Old South and the Plains States that hamlets are fewest.

Figs. 17 and 19, showing by ratios the distribution of the unselected groups of hamlets, have many resemblances to Figs. 16 and 18, thereby tending to substantiate the reality of the distributions shown in the two latter figures.

I have not attempted to offer explanations for the distributional facts regarding hamlets revealed in maps for the country as a whole (Figs. 15, 16, 17, 18, and 19). They were not presented with that in mind. The entire terminal section of the paper, in which the discussion is shifted from southwestern Wisconsin to the United States as a whole, is more in the nature of a summary and an epilogue. Through it I have attempted to show that the hamlet study in southwestern Wisconsin is merely a detail of a much larger pattern, some of whose fundamental lineaments are revealed in the distribution and ratio maps for the country. These comprehensive maps give proper orientation therefore to the more restricted study. Still another reason for presenting the national maps is the hope of interesting a group of my colleagues in the subject of small nucleated settlements, and particularly of enlisting the cooperation of some of them in a nation-wide study of hamlets.

SUMMARY AND CONCLUSIONS

As one of the most numerous and widespread settlement types in the United States, the unincorporated hamlet does not deserve the near oblivion that has been accorded it by geographers and other workers in the social sciences. It is a settlement type common to all parts of the country but at the same time it is not of the same relative importance in all parts. From the maps produced by the State Highway Planning Survey it is possible to make

beginnings in a study of the distribution morphology and functions of hamlets for the country as a whole. Supplementary investigations in the field, and also of an archival nature, will be required to supplement the data obtained from the highway maps.

The study of hamlets in southwestern Wisconsin has exemplified a certain pattern for their investigation. This pattern is a very flexible one, however, and can be adjusted to the time and materials available. Field work in hamlet study is relatively time-consuming, and in an inventory of these settlements on a nationwide scale this method could only be applied to restricted representative areas.

University of Wisconsin, Madison.

January, 1943.

Titles and Abstracts of Papers Offered for Presentation at Columbus, Ohio, 1942 (Meeting Postponed)

JAN O. M. BROEK.

Unity and Diversity in Southeastern Asia.

During the last year there have been published various proposals for post-war changes in the political structure of insular and peninsular Southeastern Asia. Essentially these plans envisage some kind of fusion of the former political units into a regional body under international control. These schemes presuppose a fundamental unity of the area. In how far is this premise correct?

Southeastern Asia has a certain homogeneity in some basic features, but within the area there is a great diversity of peoples and cultures that are partly of pre-European origin and partly the result of different colonial regimes. Homogeneity is, of course, no requirement for a region, but a certain community of purpose is a necessity. In Southeastern Asia this condition is as yet not fulfilled. On these grounds it appears that a close political association *directly after the war* would produce more harm than good.

The region must not, however, be viewed only in its internal aspects, but also in relation to other areas. The latter viewpoint opens new perspectives on the problem.

East and South Asia are now in the process of "imperial devolution." After this war China and India, almost certainly, will emerge as politically independent countries. Between these two ancient and now revitalized civilizations stands Southeastern Asia, a region that probably will need to remain for some time under foreign control or protection. In the past each ruling Western Power has governed its dependency pretty much as an insulated unit. Should this continue there would emerge several independent political units. Thus Southeastern Asia might easily become a Far Eastern Balkans, a zone of strife not so much among themselves as between their powerful neighbors. Some form of federation or confederation of the peoples of this realm therefore would increase political stability by the time that the Western Powers withdraw.

There is thus good reason to be aware of this idea of unity (not uni-

formity) even if at present diversity is the dominant note. During the transition period of education for self-government every effort should be made to promote collaboration between the several Southeast-Asiatic countries with a view toward promoting the welfare of the native peoples as well as toward laying the foundations for an eventual confederacy. Since the United States will, no doubt, play an important rôle in the reconstruction of this region our educational programs should stress far more than formerly the total view of the area instead of the fragmented picture of several dependencies.

In short, a unity of Southeastern Asia does not exist if measured by its internal culture patterns, but the concept derives validity from the status of the region in juxtaposition to other regions.

PHIL E. CHURCH.

The Annual Thermal Cycle of Lake Michigan.

A full year of observations of temperatures, surface to 120 meters depth, on various routes followed by certain commercial vessels, have been taken by the Institute of Meteorology of the University of Chicago and the Woods Hole Oceanographic Institution, joint sponsors of the project. More than 40 crossings, one week to ten days apart, have been completed between Milwaukee and Muskegon during this year and, in addition, some 20 crossings out of Frankfort, Michigan, near the north end of the lake, have been run. Vertical soundings have been made every 4 to 5 miles on the average during each trip. The total number of soundings is now approximately 1300.

These records have been procured by a bathythermograph which makes a continuous trace on a smoked-glass slide of the temperature vs. depth. The pressure element has no appreciable hysteresis and the thermal element has complete adjustment in less than 0.5 second. Excellent records can be obtained from a vessel moving up to a speed of 15 knots.

The data reveal no less than five distinct periods, some of which overlap, to the annual cycle.

I. A period from early December to mid-May when the water is vertically isothermal. During this period of neutral equilibrium, overturn of the lake probably takes place quite freely. In December the isothermal condition occurs when the surface is between 5° and 6° C.

II. After early January when the lake first reaches 4° C., cooling continues at a slow rate until the minimum is reached after mid-March (2.25° to 2.5° C.). The temperature of maximum density is finally attained in early May. This period of four months may be considered as one of stationary temperatures.

III. The warming period, initiated in late March, lasts until late July. Though the first two months are required to raise the temperature to just above 4° C., at which time a thermocline is developed, the last two months bring the surface layer 10 to 15 meters in thickness to a temperature above 20° C.

IV. From late July to mid-September is a period of nearly stationary summer temperatures (20° to 22° C.). There is little thickening of the surface homogeneous layer, and the stability of this layer is at a maximum.

V. The period of active cooling lasts from mid-September to early December during which time heavy autumn storms stir the surface layer to great depth and thereby increase the temperature of the intermediate layers (to 70 m. depth). The greatest heat loss occurs during the first four weeks of this period.

GEORGE B. CRESSEY.

Asia's Post-War Geography.

China has extensive coal, negligible oil, limited iron, significant tin, tungsten and antimony, but only small amounts of other minerals. Except for areas of precarious rainfall, all arable land is intensively utilized. Industrial developments are promising, but the limited resources indicate that China cannot duplicate western Europe or eastern North America. China's size provides adequate security through defense in depth. Her geographic ambitions involve the return of occupied territory, including Formosa and the Liuchu Islands.

Japan's resources are limited but varied. Coal is adequate but iron and oil are inadequate. Copper, tin, sulphur and a few other minerals are nearly sufficient for peacetime demands. Arable land is restricted by unfavorable topography, and crop acreages cannot be expanded. Industry must rest upon imported raw materials and export markets. While the size and position of Japan proper are vulnerable to attack, her conquests have given her invaluable defense in depth. Her geopolitical location is excellent, but it is doubtful whether a small and poor area can dominate larger areas of greater resources and population. Japan wants assured access to raw materials and to markets, rather than land for colonization.

The Soviet Union in Asia possesses large reserves of coal, iron and other minerals, but not of oil. Impressive industrial developments are in progress, with larger projects to come. Unfavorable climate and soils restrict agricultural expansion, but pioneering is still under way. Geographic desires are chiefly limited to the permanent ambition of the Russian Bear to reach warm water. The Mongolian and Tannu Tuvian Peoples' Re-

publics present special problems. The Soviet Union will doubtless wish the retrocession of southern Sakhalin, and ownership of the Kuriles.

India presumably has no territorial ambition, unless it be Ceylon. The country has extensive iron and manganese, fair amounts of poor coal, but little oil. Agriculture has already spread into the irrigated Indus Valley, and further expansion is doubtful. India's size and location assure her of dominance in southern Asia.

The limited size of the Philippine Islands might suggest that they have only a second rate geopolitical future, but the islands have agricultural and mineral resources superior to those of Japan, and may well support a much larger population than now. Iron, manganese, chromium and gold are abundant, but there is neither coal nor oil so that the metallurgical industry is handicapped. The Philippines want sovereignty, assured markets in the United States and security.

Southeastern Asia, from Burma through the Netherlands Indies, presents many problems. While the area may develop into an unified bloc, considerable foreign guidance will be necessary.

That Japan must be punished is obvious, but it should be equally clear that the Japanese cannot be crushed. Offensive war must be made unlikely by removing Japan's overseas bases, but to offset these losses, Japan should be given assurance of reasonably free access to raw materials and markets.

To the Soviet Union might be assigned southern Sakhalin and the Kuriles, screening islands which should properly go to the adjacent continental power. Korea should be independent, but under the oversight of China, or perhaps the U.S.S.R. Formosa and the Liuchus should be returned to China. The former German islands, now mandated to Japan, should either be placed under international control or assigned to the Philippines. In either case they would cease to be a threat to Hawaii.

ALDEN CUTSHALL. (Introduced by Guy-Harold Smith.)

Vincennes, Indiana: A Study in Urban Geography.

The site of Vincennes is a Maumee gravel terrace about a mile in width, extending as an irregular tongue-like projection between the river and the eastern sand hills and bluffs. The city was originally a significant river port, but that has long since ceased to be the case. The early inhabitants usually followed agricultural or commercial pursuits, the French land grants having divided the prairies around the village into small narrow tracts so that each proprietor had a frontage on the Wabash River.

The present city contains more than fifty industrial and wholesale plants, the majority being small community or service industries. Of the remainder, three manufacture strawboard, paper and kindred products, and

two are glass factories. Other important industrial concerns include a shoe factory, a plant making structural steel bridges, a wholesale bakery, a creamery, and a canning factory. The bridge plant and a window glass factory have been in Vincennes since the turn of the century, but the other major establishments have a shorter history.

While the early growth of the city was based upon a riverine location and the fertile agricultural land of the lower Wabash plain, later growth has been more closely associated with the nearby mineral fuels, along with certain cultural factors. The regional leadership long held by the city has continued because of its diversified economic interests, its somewhat larger size, and the ease of communication that it enjoys with other urban centers of southern Illinois and Indiana. In general, Vincennes does not depend upon the surrounding rural areas, but they depend upon Vincennes, both for day-to-day and seasonal purchases.

KENNETH H. DOAN. (Introduced by Bert Hudgins.)

Ice Fishing as a Community Occupation in the Island Region of Western Lake Erie.

In the isolated community living on South Bass Island, Ohio, a winter fishery by hook and line through the ice contributes to the integration of social interests in what otherwise might be a dull part of the year, to the nation's food supply, and is of economic value to the islanders. The development of the fishery has depended greatly upon better transportation of the catch to mainland markets. This paper describes the gear used and discusses fluctuations in the size, numbers and value of the fish as factors in the catch. In the winter of 1942, 41,514 pounds of fish were sold, and these fish were caught at the rate of 3.67 pounds, or 6.61 fish, per fisherman-hour. This is a higher rate of return to the angler than in most lakes. Average fisherman-earnings through the winter season of 1942 were at the rate of 42 cents an hour, and this is the only income of many island families throughout the winter.

STANLEY D. DODGE.

The Depopulation of Maine from 1840 to 1940.

For eighty years after the French and Indian Wars, the settlement of the interior of Maine proceeded steadily, along the principal rivers west of the Penobscot. About 1840, however, a marked change comes in the course of settlement. From that date till the end of the century, nearly four hundred towns lost population. Many other towns gained population, and some of those which lost gained subsequently. The principal cause of depopulation appears to have been the unfavorable financial position of people

in the inland towns when they faced the competition of the industrial and commercial people of the coast and river towns. After the beginning of manufacturing, about 1840, the financial disequilibrium increases. The circumstances of the alterations in population distribution are examined, and more detailed statements are made covering depopulation in Maine, part by part and period by period, all against the general background provided by the principal cause.

OTIS W. FREEMAN AND H. F. RAUP.

Strategic Minerals of the Northwest.

In 1940, the Pacific Northwest supplied nearly 1/6 of the copper, 1/3 of the lead, 1/5 of the zinc, 1/4 of the mercury and 1/2 of the high-grade manganese produced in the United States. Some antimony, chromium and tungsten were also mined. War demands have stimulated the search for other essential minerals, with some success. Iron ores and coke are available in quantities sufficient to justify the construction of blast or sponge iron furnaces and additional steel mills besides those which now use northwestern scrap iron. Steel alloy metals, especially chromium and manganese from Montana, and vanadium and tungsten from Idaho are obtainable in the northwestern states and will be more than adequate for the needs of furnaces making special types of steel. Such steels might be made in electric furnaces. Newly developed mines at Stibnite, in Valley County, Idaho, are now the leading producers of tungsten and antimony in the United States. A plant to extract vanadium from phosphate rock of Idaho is under construction.

Of the non-ferrous metals, the manufacture of aluminum occupies the most important position in the Northwest, because of abundant hydroelectric power from the Grand Coulee and Bonneville Dams and the market afforded by the aircraft industry of Seattle and California cities. At present, the mills now use imported bauxite, but there are supplies of alunite and certain clays available in Washington and elsewhere from which aluminum might be obtained. Aluminum plants in the Northwest are expanding production and will soon attain 600 million pounds annually. Magnesium is also being made by an electro-metallurgical process from dolomite. Sometime the magnesium may also be made from magnesite of which the world's largest known deposits are available at Chewelah, Washington. Other non-ferrous metals include antimony from Idaho, which is replacing former imports from China; arsenic and bismuth from Montana; and cadmium from British Columbia, Idaho and Montana.

One-sixth of the nation's copper production, of prime war-time importance, comes from Butte, Montana, and Holden, Washington. Idaho's

tonnage of lead is second only to that of Missouri, and large amounts come from Montana and a little from Washington. Zinc is produced in the Coeur d'Alene district, at Butte, and in the Metaline district of northeastern Washington. Oregon's production of mercury is second only to that of California, the leading state. Idaho is now third among states producing mercury. In the Northwest, silver is largely a by-product of gold, lead and copper mining.

Strategic non-metals, such as cement, phosphates, magnesite, clay products, and diatomaceous earth, are being produced. Others, such as mica and abrasives, may become of importance in the future. Other necessary mineral products are available and may supply northwestern manufacturers with plentiful raw material for future operations.

BERT HUDGINS.

The South Bass Island Community (Put-in-Bay).

The island is one of an archipelago of about 20 in Lake Erie, extending from the Ohio mainland to Point Pelee, Ontario. About the islands, and to the westward, Lake Erie seldom reaches a depth of 40 feet, and shoals and reefs are numerous. The total area of the archipelago is 25 square miles. That of South Bass Island is 1,450 acres.

Rocky wave-worn shores are characteristic throughout the archipelago. The bedrock consists of resistant limestones and dolomites dipping mostly to the east and southeast from the crest of the Cincinnati anticline. Geologic disturbance, long after the uplift of the anticline, is evidenced by the disturbed stratification, rock cavities and caves, and the crystallization of strontium sulphate within the latter. Glaciation overrode all of the archipelago, and post-glacial lake waters either submerged all, partially submerged them, or left them tied to the Ohio mainland, depending upon the stage of the lake.

South Bass Island is unique in that it has the best harbor, the largest and most interesting caverns, the highest elevation, and greater historic interest and attraction than any other of the Lake Erie Islands. Fur trading and a lumbering period featured early history of the island. Cordwood and shipbuilding lumber supplied the lake shipping industry after the opening of the Erie Canal in 1825. Settlement was late because of private ownership of the island, but land was parcelled and a "boom" came immediately before the Civil War. The small size of farms, good limestone soil, and extended growing season under the lake influence has favored viniculture. Wine is a chief product of the island, but its importance has varied with prohibition, the development of transportation, and outside competition. Fishing is an important industry, and the State Fish Propagation and Biological Research

Laboratories are located here. Steamers bring thousands of tourists during a summer season. Agitation for a Perry Memorial monument lasted for more than a half century, bringing thousands of visitors. It was completed in 1915, but summer visitors continue to come.

The permanent population of the island is about 500, and it is stable. The relations of people to the island environment have varied, but vineyards, the fishing grounds, and those physical and historical aspects of the island which attract the tourist are the chief resources and are intimately related.

J. SULLIVAN GIBSON.

Cattle Industry in the Black Belt—Successor to Cotton.

Long recognized as one of the South's potential beef cattle regions, the Alabama Black Belt acquired little interest in this industry until the pronounced decline of cotton a quarter-century ago. The latter half of this period—the post-experimental period—has seen phenomenal growth, and the cattle industry now comprises an important part of a balanced stock-farming program based on pasturage, feed crops, and cotton. Recent growth of Montgomery's cattle market to leading place in the southeastern states, and the rise of several smaller markets, further improves the economic balance of the region's beef cattle industry. Improvement of herds, more pronounced than increase in cattle numbers, bespeaks distinct progress. Herefords dominate, as the result of the introduction of registered bulls to practically all stock farms.

Most physical factors favor cattle raising in the Black Belt. They include: calcareous soils adapted to native and introduced grasses, legumes, and hay crops; non-pasture upland and low-lying alluvial soils adapted to corn and hay; a mild, rainy climate with grazing season from March to November, inclusive. Human factors appear about evenly balanced, favorable against unfavorable. Relatively large land holdings, considerable capital, reasonable land values, expanding markets, and intelligent white supervision tend to promote the industry. An inefficient labor supply, a population pressure (largely Negro) demanding a more efficient system of land utilization, and a shortage of locally-grown feeds, oppose further progress.

Further expansion depends upon increased production of feeds, lessening of Negro population pressure through continued migration, training of Negroes for handling cattle, and more active participation in farm work on the part of white farmer-stockmen.

HOYT LEMONS. (Introduced by William H. Haas.)

Semi-Monthly Distribution of Hail in the United States.

Additional details of the pattern of hail distribution and frequency in the

United States are portrayed by twenty-four semi-monthly maps. No parts of the country have mean semi-monthly frequencies of more than 0.5 hailstorm during the entire cool half of the year, September 1–February 29, at which time the atmosphere is relatively stable. Vast regions experience no hail. A hail-free area originates in Montana in early October. Wedge-like, it develops southward, meanwhile broadening east-westward at the Canadian border. Some hail occurs in the Appalachian and Ozarkian Highlands throughout the cool period. Atlantic and Gulf Coastal areas are practically hail-free. Much of the West Coast from central California northward experiences 0.5–1.0 storms semi-monthly during the latter part of the period. Actually, however, snow pellets and very light hail, rather than large, solid hailstones, predominate.

During the warmer half year, March 1–August 30, most of the country has mean semi-monthly frequencies of 0.1–1.0 hailstorms. In the heart of the country the frequency is one-two storms, semi-monthly, from May 1–June 30. Beginnings of unusual hail activity are detected in the southern Great Plains in late March. Oddly enough, this activity abates during the first half of April, thereafter, as pointed out in previous publications, it spreads rapidly northward and somewhat westward. From August 16–30, two remnant areas, with frequencies of 0.5–1.0 storms, disappear in the Northern Plains and Rockies. After May 1 on the west coast an area the width of California is hail-free; during July and August it spreads across the South and a considerable distance along the Atlantic Coast.

A survey of several thousand damaging hailstorms reveals the late afternoon as the time of daily maximum frequency and one and one-half miles as the mean width of storm tracks. The time of daily maximum frequency approximates the time of the daily maximum temperature, the time when the earth's surface is hottest and the lower atmosphere is very unstable. Hail usually comes in the early life of the common thunderstorm while the storm track is still narrow.

TREVOR LLOYD. (Introduced by Wallace W. Atwood.)

Mackenzie Waterway: A Northern Supply Route.

United Nations war strategy requires communication and supply routes between industrial centers in North America and bases in the Yukon, Alaska and Soviet Siberia. The five most important available routes are: 1. North Pacific or coastal shipping based on Seattle, Vancouver or Prince Rupert. 2. Airline routes such as that connecting the Twin Cities with Edmonton, Fort St. John, Whitehorse and Fairbanks. 3. The "Alaska road" which follows approximately this line of airfields beyond Fort St. John. 4. A projected railway northward from Prince George, B. C., fol-

lowing the "Rocky Mountain trench." 5. Mackenzie Waterway running from Waterways, Alberta, to the Arctic Ocean. This paper discusses Mackenzie Waterway as a summer transportation route.

For the first hundred years following the exploratory voyage by Alexander Mackenzie in 1789, the river was used almost exclusively as a supply route for the fur trade. This is still its principal function, although it also carries supplies for government posts and missions. In the past ten years the transport of passengers and freight to mining settlements has become important. At present, there is the additional possible use of the route for supplying airfields and military personnel, and for troop movements.

The Mackenzie route is a complex system of lakes and rivers of which commercial vessels cover about 3,400 miles between May and October. The trunk route is from the end of steel at Waterways to Port Brabant (Tuktoyaktuk). The paper discusses this route, its several component parts, and its subsidiary routes.

The main waterway is far from uniform. It is discussed under the following subdivisions: Athabaska River, Lake Athabaska, upper Slave River, Fort Smith portage, lower Slave River, Great Slave Lake, Mackenzie River, delta of Mackenzie, and coastal waters. It flows through a variety of physiographic regions and areas of different climates. Water conditions and the navigation dependent on them are variable, both from place to place and in different years. The equipment needed varies with each section. Barges pushed by steam, diesel or gasoline tugs are in general use, and single cargoes have exceeded a thousand tons. The types of cargo are discussed, together with their destinations, and costs and conditions of shipping. In the summer of 1942 some modifications took place in normal work because of military use of the waterway. The physical difficulties encountered are mentioned, and possibilities of large-scale military or commercial freighting in the future are considered. The paper is accompanied by maps and diagrams and by a table giving dates of opening and closing of the navigation season at each settlement.

F. J. MARSCHNER.

The Roman Origin of the Rectangular Survey System.

Rectangular land division in America is known from colonial times, but its more extensive use followed the Revolutionary War. The system was adopted by Congress in 1785, for the settlement and development of the public domain, and some of the colonial states and Texas divided parts of their unsettled lands into rectangular tracts. About 80 to 85 per cent of the land in the United States is so divided now, and our typical American cities, and many of our states, counties and minor civil divisions are laid out on the rectangular system.

It is known that the rectangular land survey system was used in Holland before 1492, and some parts of Ireland were divided between 1654 and 1658 into coordinate rectangular tracts. It is also known that the Romans used rectangular land divisions in their military colonies, but to attribute Roman origin to the American system requires elucidation of the ways and means of transmission from the antique through the Middle Ages to modern times. The last period has been diligently covered by Amelia C. Ford in the "Colonial Precedents of Our National Land System." The antique is recorded in the writings of the Roman agrimensores themselves, of which much has been transmitted to us. After the downfall of Rome, abridged copies and excerpts from these documents were collected by the monasteries, additional manuscript copies were made during the Middle Ages, and later issued in printed form. Between 1491 and 1674, not less than 19 printed editions of these collections or parts of them are reported from Central Europe.

Knowledge of the Roman survey system was therefore widespread and accessible in Europe at the time the first settlers arrived in America. There is also sufficient evidence that this knowledge was transmitted to America. In fact, it may be said, the United States is the principal heir of the Roman survey system. Our typical American city plans, in which the city is divided by two rectangular intersecting main streets into four quarters, and laid out in square blocks, are modern replicas of the ground plan used by the Romans in their military colonies. The modern part in these city plans is nothing but nomenclature and the use of the cardinals for orientation. Although the Romans had terms for east, west, north and south, they did not use them in their military colonies to indicate directions with reference to the axes of rectangular coordination, but employed a unique system of their own. Square divisions were, moreover, an exclusive characteristic of the military colonies. For civil farm settlement the Romans used the long-lot divisions mostly without rectangular coordination.

RAYMOND E. MURPHY.

Migration of the Production Center in the Appalachian Bituminous Coal Region.

Within the last ten or fifteen years West Virginia has displaced Pennsylvania as the nation's leading bituminous coal producer, and there has been a spectacular rise in the production of Harlan County, Kentucky, and of the westernmost counties of Virginia. Coal producers in the "Northern" fields have been losing ground to operators in the "Southern" fields in spite of the latter's greater distance from markets. But this southward production

shift, though widely inferred, has been recognized only in its vaguest outlines. In this paper the trend is analyzed objectively by application of the centro-geographical method.

The study begins with 1869, the first year for which reasonably reliable production data are available on a county basis. For that time and for each decennial census thereafter production figures were obtained for all commercially producing counties. Then for each one of these years a center of production (or center of gravity of production) for the entire region was determined by a method similar to that used by the United States Bureau of the Census in calculating its center of population of the United States.

The resulting cartogram shows a progressive southwestward shift of the center of production, a shift that was in progress at least seventy years ago and that is still continuing. In 1869 the center was in western Pennsylvania, some ten miles southeast of Pittsburgh; in 1939 it was one hundred forty miles farther to the southwest, just twenty-five miles northeast of Charleston, West Virginia. There has been no interruption of the southward progress, and the successive centers are arranged in a northeast-southwest line paralleling in a general way the axis of the geosyncline that forms the coal basin.

The question is raised as to the ultimate destination of the migrating center of production. What should be the relation between its movements and the position of such additional centers as those of area, of original resources, or of remaining reserves? The fact that it is still some distance northeast of the center of original resources suggests that it is destined to continue moving. It even may move an appreciable distance beyond this center, since the area farther north has been so steadily producing more than its share of coal.

GEORGE H. PRIMMER.

Some Trans-Pacific Trade Losses.

Persons instrumental in securing Alaska for the United States visioned a future with Pacific trade dominant. When we acquired the Philippine Islands we hoped they might help promote our commercial interests in the opulent Orient. As indicative of potential trans-Pacific trade, note the recent near-tripling of population of Asiatic Russia, along with a tripling of cultivated acreage. We may have to furnish Siberia with emergency supplies of petroleum, aluminum and manganese.

Closing of the China coast means we no longer receive the antimony, the tung oil, the shelled peanuts, the dried eggs, and the coarse carpet wool formerly leaving ports now under Japanese control. Recently, sources of about half our tungsten imports dried up in China, British Malaya, and

Burma. We should strive valiantly to keep open the sea route to mica of India and chromium of New Caledonia.

Losing the Philippines cost us tobacco, sugar, coconut products, and the more significant Manila hemp (99% a Philippine product); acquisition of the manganese, chromite, copper, and iron meant a relatively larger gain to Nippon than it meant of loss to the United Nations. Relinquishment to Japan of rubber producing areas by United Nations forces staggered us, but, with our synthetic program now gaining momentum, likely will not knock us out of the war. Inability to import some two-fifths of the world's tin production discommoded but does not demoralize us.

Loss of pepper and of cashew nut imports should cause little concern; inability to get tea as usual should not put a material brake on our war effort; this is hardly true for silk, but we seem to manage the problem well, chiefly with use of stock piles and of substitutes. Loss of petroleum of Netherlands Indies probably meant little immediate profit to the Japanese but added greatly to United Nations supply problem. We should willingly forego use of Hawaiian sugar and pineapple if released shipping helps assure us of a reasonable measure of control of Pacific waters. We had a large stock of kapok from the Dutch islands but less, relatively speaking, of quinine, as yet a not fully solved problem.

Eventually we shall bring our Pacific enemy to terms and again have our portion of desirable Oriental goods—equitably shared, we hope, with our onetime foes. To paraphrase the remark of a famous Englishman—Having met disaster like men, may we meet success like gentlemen.

ERWIN RAISZ.

New Maps and Methods.

1. *Tables for construction of oblique stereographic hemispheres.* The global war demands oblique azimuthal projections. The easiest way to construct them is by transforming them from a stereographic projection with the same tilt. All parallels and meridians are circles. Forty six tables are presented, one for each second degree of tilt. They give the centers, and upper and lower points of every 10th parallel, and meridian.

As the various azimuthal directions differ from each other only by the radial distances from the center, radial scales are provided for the transformation. Mimeographed copies may be obtained from the author.

2. *Orthoapsidal world maps.* In the regular orthographic projection only the hemisphere can be shown. Some interesting maps of the entire world can be obtained by applying a parallel and meridian network to other solids than the globe and using an oblique orthographic view for the map. The common advantage of all these projections is that, although the distor-

tions are very great on the peripheries, they do not seem to be distorted because the eye does not perceive them as flat maps but as pictures of solids. This is shown by the "armadillo," bifolium, trifolium, interrupted hyperboloid, and other examples.

3. *Our lopsided earth.* Almost all geographical factors are very unevenly distributed over the earth's surface.

Land area: (1) Center of gravity of the earth's land surface was obtained by covering all land surfaces of a globe with a sheet of lead and floating it in water. This point was found to be near the town of Balcic on the Black Sea, near the Bulgarian-Rumanian border. (2) Median point of the earth's land surface—the crossing of two great circles with equal land on opposite sides—was located near Ismir (Smyrna), Turkey. (3) Center of land-hemisphere, containing 81 per cent of all lands, was located near Tours, France.

Population: (1) Median point of earth's population, divided by a parallel and a meridian, was found to be near Lahore, India. (2) Same in 1900 was located also near Lahore. (3) Median point of earth's population, divided by two great circles, was estimated near L. Balkash. (4) Center of *peoples hemisphere*, containing 94.5 per cent of all people, was located in the French Alps.

Other centers: The center of foreign trade, center of natural wealth, and some others are peculiarly clustered about France.

Degree of lopsidedness is expressed with diagrams by comparison with the most and least even distribution. Various conclusions are reached as to how this lopsidedness influences human destiny.

4. *Problems of map- and airplane-photo reading courses.* It is proposed that the Association make a census of such courses and use its influence for the release by the War Department of maps and airplane photographs of 60 type regions of enemy countries and also some local photos for these courses. An outline for the most efficient conduct of these courses is presented.

5. *Comments on exhibits:* (a) Relief model of the United States. (b) Map of Concord, Mass. 1:12,000. (c) Diagrammatic map making.—Blackboard maps.

H. THOMPSON STRAW.

Changes in the Land Utilization of Humphreys County, Tennessee.

The need for changes in land utilization within Humphreys County, Tennessee, arises from two causes: first, the desirability of raising the low incomes of the people and reducing the widespread need of relief which has been evident during the past decade, and secondly, the necessity of re-

settling many of the inhabitants whose lands are to be flooded by the creation of the Kentucky Reservoir by the Tennessee Valley Authority. The county is one of ten similar political units located in the much-dissected upland of the Western Highland Rim Plateau. The entire plateau is a region of self-sufficient farms of low income, widespread illiteracy, inadequate schools and roads, and substandard houses lacking many conveniences, and this is fairly true of this particular county also. The relief loads have been high and so has the amount of state aid for schools. These chronic problems of low economic standards will be rendered more acute by the building of the Gilbertsville Dam across the Tennessee River which will create the Kentucky Reservoir, inundating the broad strip of alluvial lands of the counties bordering the river, of which Humphreys is one.

There is a widespread diversity of surface and soil and of present land use within the county. The following divisions can be recognized: the valley bottoms of the Tennessee and Duck rivers with their fertile alluvium which is devoted to corn and lespezeza seed; the Buffalo river bottoms, nearly as fertile and with similar crops, plus peanuts; the creek bottoms and hills with more diverse soils, where the flats are devoted to general farming and the hill slopes to pasture and forest; the steep ridges where all uses other than for woodland should be discouraged; the ridgeland, less steep, where subsistence agriculture, in which the raising of animals plays a large part, is possible; and the McEwen upland, gently rolling but with soils of medium to poor fertility.

The low economic standards of the county may be improved by the fostering of better farm practices through the agency of the Tennessee Extension Service and the T.V.A. Examples of lines of improvement are: Shifting marginal cropland to pasture, replanting eroded slopes to forest, and the encouraging of such cash crops as lespezeza seed rather than corn. Additional income from such sources as the forests and the development of recreational facilities along the reservoir will also help to raise the economic standards.

The necessary resettlement of the people from the reservoir area through the help of the Farm Security Administration and the T.V.A. will mean a more intensive use of certain lands, especially the uplands. Here the old cash-grain economy of the lowlands will not suffice, and the settlers must be taught a new economy in which dairy or beef herds play a predominant part.

STEPHEN S. VISHER.

Some Novel American Climatic Maps and Their Implications.

In the successful prosecution of the war and in the difficult post-war adjustments, as adequate knowledge as is available of climatic conditions is

highly desirable. Analytic studies have been recently made of many climatic data now available. Of numerous new maps prepared, 15 are shown with this paper; some of their special revelations are pointed out, and some of the implications discussed. Perhaps the major basis for progress is the attempt to answer specific questions as to distribution, significance, and causal relations. These maps encourage the formulation of many challenging questions. The maps shown are: mean and extreme annual range of temperature; spread between mean and extreme range; difference between January average and mean minima; difference between July average air and wet bulb temperatures; difference between July average and mean maxima; superimposed isolines of four sorts; seasonal shifts in areas of light and heavy precipitation; summer vs. winter precipitation; spring vs. autumn precipitation; spread between "relatively" wet and dry years, and the normal variation therein; greatest and least precipitation totals in the wettest and driest years of a half century; ratio between these totals. This paper is to be published in full in the *Monthly Weather Review*.

DERWENT WHITTLESEY.

Geopolitics, a Program for Action.

Geopolitics, as presented by its German protagonists, is directed exclusively to practical applications.

Its distinction from political geography has been stated in a number of ways. Some of these expressions may be paraphrased as follows:

- a. It constitutes a plan for what should be, rather than an accounting of what is.
- b. It undertakes to outline the future, not to analyze the past and present.
- c. It is dynamic, rather than static.
- d. It makes geography a servant of the state, instead of viewing geography as a condition of the state.

German geopolitics, then, studies the natural environment with a single objective—the improvement of the position of the state with relation to the world total of natural conditions and resources. The state guided by geopolitics disregards conservation in its planned utilization of resources. It knowingly practices "robber politics," akin to the "robber economy" of unrestrained and unplanned capitalistic society.

Because the state is more powerful than any aggregation of capital within it, "robber politics" is a still more serious threat to the earth's resources than "robber economy." The consequent despoliation is intensified by intrinsic traits of all governments. (1) Governments are monopolies, and therefore not subject to any inherent check. (2) The lag between destructive govern-

mental acts and punitive nature is greater than that between destructive economic exploitation and nature's retribution. (3) Rulers, even good ones, are rarely aware of the ways in which government affects earth conditions. Hence, they may mistakenly cause damage before they realize it. Wrong-headed rulers can irreparably despoil the earth-base of their country by persisting in destructive use of its resources.

The action-program of German geopolitics concerns not only the country initiating the program, but also the outside world. "Robber politics" is applied to both, in different degrees and at different times.

Two methods are employed for putting the program into operation. The first of these is propaganda, including child and adult education. By internal propaganda the populace is conditioned to condone temporary abuse of the country's resources in order to gather striking power to expand the national boundaries in the hope of incorporating additional resources along with additional territory. External propaganda is calculated (a) to predispose favoring elements in other countries toward the ambitions of the program's sponsor, and (b) to terrorize the opposition into accepting the program.

The second action method is war, or threat of war. Investigation of German geopolitics from any angle leads to its program of planned aggressive war, for the purpose of seizing and incorporating territory and natural resources.

The outlines of German geopolitics have been made fairly clear in recent studies. It now remains to discover whether a geopolitics program can be formulated for countries which do not envision war as the inevitable state of political society.

